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## RESIDUAL STONES IN THE CYSTIC DUCT FOLLOWING CHOLECYSTECTOMY

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**S**TONES in the cystic duct following cholecystectomy are infrequent if one may rely on the meager reports in the literature. Their presence is rarely suspected, the symptoms are unusual, and if jaundice is present stones in the common duct is more likely to be the diagnosis. The occurrence of 2 cases of stones in the cystic duct within a period of three months is the occasion for this paper.

The origin of such stones will probably always remain a controversial point. There seems no logical way of determining whether they are residual in the duct, having been overlooked at the time of operation, or whether they have developed subsequently to the removal of the gallbladder. Anomalies of the duct system may go undetected, or altered relationship due to pathologic conditions may prevent satisfactory exploration of the structures. The cystic duct has been found unusually long in some cases with a low insertion into the common duct. It is conceivable that an elongated cystic duct may appear normal, although it contains an unsuspected stone which may inadvertently be allowed to remain. The edema and induration associated with acute cholecystitis often obscure the ducts and vessels, and in an effort to avoid the pitfall of common duct injury an excessively long cystic stump may be left. Clute reports 3 clinical cases of cystic duct stone after cholecystectomy and expresses the opinion that the cystic duct may well be the place for retention of stones if not actually the point of their formation. Beye, in 1936, reported 14 instances in which long residual cystic ducts had become so dilated as to resemble reformed gallbladders and they produced such serious disturbance as to necessitate secondary operations. He thought that long cystic duct stumps were subject to hydrostatic

pressure from the common duct and likely to become dilated. The distended ducts resembled small gallbladders but did not contain the mucosal or muscular components of the gallbladder. Hicken recently reported a series of 7 clinical cases with persistent recurring symptoms attributed to stones or pathology in the cystic duct. He thought that continued gallbladder distress was due to incorrect preoperative diagnosis, to residual hepatic disease or to incomplete surgery. He advocated the removal of the gallbladder and cystic duct at operation. I might suggest in the cases of acute or subacute cholecystitis with marked edema and induration, where it might be advisable to leave a long cystic duct stump, that the cystic duct be carefully milked to evacuate stones into the gallbladder before the duct is sectioned, or that it be explored after it has been cut.

I believe that most of us will agree that the nature and degree of the pathologic changes in gallbladder diseases are often out of proportion to the severity of the symptoms. We frequently disclose unrecognized gallstones by roentgenology in patients with few or no complaints or we may be greatly surprised at operation to find subacute inflammation of the gallbladder in a patient who has not recently had colic, and occasionally we are disappointed to find a relatively normal gallbladder in one who has had severe colic. It seems, therefore, that the exact pathologic picture cannot always be accurately appreciated before operation by our present methods of investigation, including the valuable information afforded by cholecystography, but as a rule we can in a high percentage of cases gather sufficient evidence to indicate gallbladder disease.

With residual stones in the cystic duct, the absence of the gallbladder renders direct roentgenographic studies of little aid in making the diagnosis. The symptoms are likely to be bizarre, of such long standing as to prompt one to consider a functional disorder, or when clouded by drug addiction to make one wary or timid about resorting to surgical exploration.

#### CASE REPORTS

The first case was a 69 year old female who had had symptoms persisting for 19 years after a cholecystectomy. The one complaint was a dull pain, occurring almost daily, localized to the upper right quadrant. In the absence of dyspepsia, jaundice, nausea, vomiting or bowel irregularity, I would have strongly favored a functional disorder but for the chance finding on an x-ray of the kidney area of a suspicious, small, opaque shadow in the upper right quadrant. A complete gastrointestinal x-ray series was made. The stomach and colon were normal. The gallbladder was reported as non-functioning as would be expected if the gallbladder had been removed. When a stone in the kidney was ruled out by an intravenous urogram, and in the absence of jaundice, I was encouraged to explore for a stone in the cystic duct.

The abdomen was opened through an upper right rectus incision by excising the old scar. The duodenum and hepatic flexure of the colon were adherent to the under surface of the liver, but a line of cleavage was found and the common duct readily exposed. It appeared and felt normal and was only slightly, if at all, enlarged. The cystic duct stump, however, was approximately 1 cm. in diameter and 2 cm. long, and felt as if it contained a stone. It was opened and found to be literally packed with small stones. The stones were evacuated and the duct removed. The common duct was next explored and found unobstructed. The patient had an uneventful recovery and has had no recurrences of her pains for the 5 years since her operation.

The second case was more confusing since the patient had become somewhat addicted to morphine. She was a 47 year old white woman, who entered the hospital on Dec. 5, 1942. Her past history showed that in 1926, at one operation, she had had both tubes, one ovary, the appendix and the gallbladder with 3 stones removed for a 9 year complaint of recurring colics with jaundice. The patient was relieved of pain and restored to good health for 5 years. Then, in 1931, she had begun again to have attacks of severe cramping pain in the epigastrium which radiated to the back. In the months of June and July the colics had been almost continuous, thereafter at intervals of 2 weeks or less, and had lasted a few hours to 3 days. Except for occasional bloating there had been no associated dyspepsia such as heartburn or sour stomach. In fact, her appetite had been exceptionally good, attested by a weight of 240 pounds the previous spring, since reduced to 180 pounds the preceding 5 months by diet and illness. There had been no jaundice, chills or fever accompanying the attacks. She had been chronically constipated, but the stools were normal.

The past history revealed that in addition she had had a thyroidectomy in 1938 for an "inward goiter." She also related that 2 or 3 years prior to admission she had passed gross clotted blood in the urine after an attack of abdominal pain. Subsequently, or 18 months previously, she had had spells of bladder trouble characterized by straining, frequency, and dysuria. Slight dyspnea, occasional fluttering and pain over the heart were the only other complaints.

This patient's frequent attacks of abdominal pain had practically made her an invalid the last 6 months. Morphine seemed the only drug offering relief. Nitroglycerin had been used without benefit. The local doctors, often finding it difficult to call and administer hypodermics, had instructed the patient in self-administration and left with her an ample supply of morphine which she tried courageously to use sparingly. At times she weathered a spell without the drug; while again, 2 or 3 hypodermics might be needed to subdue an attack.

Physical examination revealed an apparently healthy and at least not acutely ill white female, 5 feet, 6 inches tall, who weighed 180 pounds. The skin and sclerae were clear. There was an old thyroidectomy scar without evidence of recurrence. The heart and lungs were not unusual. The blood pressure was 124 mm. systolic and 80 mm. diastolic; the pulse was 80, regular and of good quality. The abdomen was obese with old upper right rectus and low midline scars, but otherwise normal. Nothing unusual was made out on vaginal or rectal examination.

Clinical investigation showed the erythrocytes to be 4.66; the leukocytes per cubic millimeter of blood 5200, and the hemoglobin 90 per cent. The Kahn was negative. The urine had a specific gravity of 1.022, and a trace of albumin. A complete x-ray series (gastrointestinal and K.U.B.) were done. They were negative except for non-visualization of the gallbladder.

It was quite difficult to decide upon a course of treatment for this patient whose only symptom was pain. The character and distribution of the pain were typical of gallstone colic but the self-administration of morphine created the suspicion of addiction. However, chiefly because of the previous experience of a stone in the cystic duct, exploration was advised. Operation was done on December 7. The old upper right rectus scar was excised. The common duct was exposed with difficulty. It appeared normal. In the region of the cystic duct was found a small hard mass which proved to be a single stone approximately 1.5 cm. in diameter which was impacted in the stump of the cystic duct. This patient had an uneventful postoperative course following removal of the stone and exploration of the common duct. She was seen at intervals for the next 3 years and remained free of pain.

It is well to keep in mind that stones in the cystic duct may account for some of the dyspepsia and colics occurring in post-cholecystectomy cases which in the past we have been prone to attribute to spasm of the sphincter of Oddi. Hicken et al recently presented a series of 7 cases with persistent or recurring indigestion, colic, or jaundice, appearing 2 months to 8 years after cholecystectomy. Stone in the cystic duct was also his most frequent operative finding, but he encountered other equally unusual conditions. In one of his cases there was a dumbbell-shaped stone in the cystic duct which protruded into the common duct and caused obstruction. In another case there was a long fibrous cystic duct remnant attached to the under surface of the liver which had contracted and so angulated the common duct as to give rise to obstruction. Beye in 1936 gave the name of "reformed gallbladder" to the greatly dilated and cyst-like cystic duct stumps. Hicken had one such case in which the duct passed through the foramen of Winslow and entered the lesser peritoneal cavity.

In conclusion, I would like to call your attention to:

1. Residual stones in the cystic duct as one of the causes of post-cholecystectomy colic, dyspepsia, and occasionally jaundice.
2. The diagnosis in the absence of jaundice may be difficult.
3. The long duration of symptoms, 16 and 19 years respectively, in my 2 cases may incline one toward considering a functional disorder, particularly if pain is the only symptom.
4. One is limited in preoperative investigative measures. If common duct exploration is negative, examine carefully for a remnant cystic duct.

#### BIBLIOGRAPHY

1. Clute, H. M.: Cystic Duct Stones after Cholecystectomy, *Surg. Clin. North America* 13:603-608, 1933.



2. Best, R. R., and Hicken, N. F.: Nonoperative Management of Remaining Common Duct Stones, *J.A.M.A.* 110:1257-1261, 1938.
3. Beye, H. L.: Conditions Necessitating Surgery Following Cholecystectomy, *Surg., Gynec. & Obst.* 62:191-202, 1936.
4. Hicken, N. F., and Best, R. R.: Cholangiography: The Visualization of the Gall Bladder and Bile Ducts During and After Operation, *Ann. Surg.* 103:210-229, 1936.
5. Hicken, N. F.; Coray, Q. B., and Orem, J. F.: Postoperative Cholangiography, *Rocky Mountain M. J.* 38:709-713, 1941.
6. McDonald, D.: Symptoms Following Cholecystectomy: Some Brief Clinical Notes, *Am. J. Surg.* 62:19-33, 1943.

## THE ACUTE ABDOMEN

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**A**CUTE abdomens are an ever-present condition that confronts the physician, internist, gynecologist, and surgeon alike. Patients presenting symptoms of an acute abdomen should be given serious consideration, prompt and continuous attention, until a definite diagnostic conclusion has been reached. If the patient has severe abdominal pain lasting 6 hours, or has had to have medication for the pain, operation is usually indicated.

The examining physician must keep in mind the anatomy and physiology of the abdominal organs which may become involved in acute pathologic conditions. Certain referred pains can be explained by the migration of some of the organs contained in the abdominal cavity from the position of their primary embryonic development. During the embryonic period the diaphragm descends from the cervical region and in its descent carries with it the phrenic nerve. When the diaphragm becomes involved pathologically (an area of about 3 inches in diameter on both sides of the esophagus) the pain is often referred through the phrenic nerve to the clavicular and scapular regions.

In its descent from the kidney region, the cecum, carrying with it the appendix, frequently fails to descend and rotate perfectly. When the appendix becomes inflamed, the site of tenderness and muscle rigidity will be over the final location of the appendix. Only 72 per cent of appendices are found in the region known as McBurney's point. The testes, which also descend from the kidney region, often fail to descend through the inguinal canal into the scrotum. The canal fails to close normally in 20 per cent of males. The spermatic nerves and vessels are carried with the testes in their descent. When the testes become pathologically involved, the pain is often referred to the kidney region and/or to the abdominal location of the testes.

The sympathetic nervous system is the watchdog of the abdomen. When pathologic changes develop in any abdominal organ, the alarm is turned in by the sympathetic nervous system which through its connection with the somatic nervous system announces to the brain centers that something has gone wrong in the abdomen.

The female reproductive organs in the pelvis do not have peristalsis. The sympathetic nerves that supply them do not have connection with the abdominal musculature. Therefore, a patient with pelvic inflammation does not have abdominal muscular rigidity, nor does she have pain on movement of the body, unless the inflamma-

tion has spread beyond the pelvis onto the abdominal peritoneum. Abdominal pain, muscle spasm and rigidity on movement of the body will then be in direct proportion to the amount of involvement of the abdominal peritoneum.

On examining a patient suspected of having an acute abdomen, the physician must keep uppermost in his mind the most frequent acute diseases of the abdomen, but not be unmindful of conditions that occur infrequently. Often physiologic and physiochemical changes take place with added toxic symptoms. In our opinion the most important factor in arriving at a correct diagnosis is a history of facts. Any other history is misleading and conducive to a wrong conclusion.

There are many factors which might prevent the obtaining of a correct history. Among some of the most common are the patient's ignorance, age and mental condition at the time of the examination. It is always several hours to several days before the surgeon sees the patient. Too often the symptoms and physical findings at the time the patient is seen have materially altered due to the progressive changes in the pathology. This makes it necessary to get a correct history of the primary onset of symptoms. To do so it is important to determine the date and hour of onset, what the patient was doing at the time of the onset, and what the reaction of the patient was to the first symptoms. This is not always easy and in some instances is impossible to obtain if the patient is in an abnormal mental state or if the present acute abdominal condition came on as a separate entity during some other acute febrile disease.

Keeping in mind the primary pathology of different diseases of the abdominal organs and their production of symptoms as the pathology progresses, the symptoms must come in chronological order. In arriving at a diagnosis, the first and foremost conclusion is to determine whether one is dealing with a surgical abdomen. This decision should not be delayed. A history of facts will often make a diagnosis in itself.

All acute conditions of the abdomen begin with pain as soon as the pathologic changes have advanced to that phase. The first alarm is registered by the sympathetic nervous system.

We divide our acute abdomens into groups according to the onset and character of the pain. In Group 1 the disease comes on with a pain which may be mild or severe, usually cramp-like in character, but increases in severity and is most often due to inflammation of an infectious nature. The pain in inflammatory conditions of the

abdomen comes on in chronological order and often changes in character and location.

Group 2 is composed of patients with sudden, severe, and often agonizing pain which is almost always cramp-like in character. This pain lasts until there is some change in the pathology and with added symptoms as to the pathology progresses and involves other structures. This group includes mechanical alterations of some foreign body in a hollow viscus or the viscus itself becomes incarcerated in an abnormal opening in the abdominal cavity. If gallstones and kidney stones should become loosened by over-distention of the involved viscera, the stones might slip out of their positions or if an incarcerated hollow viscus becomes disengaged, the patient would be relieved. On the other hand, if the calculus or viscus remained impacted, one would have progressive symptoms. If the strangulation continued, one would have added symptoms of obstruction of that particular organ and if there was sufficient interference with the circulation, gangrene would follow. In abdominal hemorrhage or thrombosis there is a sudden pain which may be severe or mild and which might produce a chemical peritonitis. If the hemorrhage is severe or the area involved by thrombosis is great, there will be shock and, as a rule, diminution of pain in proportion to the severity of the shock.

Group 3 consists of patients with rupture of some part of the alimentary canal. These patients have a sudden, severe, agonizing pain that is continuous and incapacitating, and have immediate added symptoms of peritonitis. In an effort to minimize the pain, the abdominal muscles become board-like. Pus cavities that rupture into the general abdominal cavity do not, as a rule, produce a sudden, severe onset of pain but the symptoms and pain increase as the peritonitis develops.

It is routine that all types of laboratory procedures and x-rays that are thought to be of any diagnostic value must be done on all patients. There is variability in laboratory and x-ray findings under certain circumstances in the same disease. In coming to a conclusion, it is best to adhere to the history and physical when the laboratory and x-ray findings do not agree with the history and physical except when such findings are pathognomonic.

The opinion and conclusions reached in this presentation are based on the study of 6,339 cases with diagnoses proved by surgery, pathologic or postmortem findings. Patients diagnosed in the Clinic and the admitting department, who did not come to surgery or postmortem examination, are omitted.

## ACUTE APPENDICITIS

Acute appendicitis, being the most frequent acute condition of the abdomen, will be discussed first. Although anyone may be stricken with appendicitis, it is primarily a disease of youth. It is a curious fact that although appendicitis is such a common disease, the etiologic factor still remains vague and indefinite, being anything which produces an inflammatory condition in the appendix. The appendix contains much lymphoid tissue and is very susceptible

TABLE I

*Chronological Order of Symptoms in Acute Appendicitis*

|   | Per Cent<br>Acute | Per Cent<br>Gangrenous | Per Cent<br>Ruptured | Per Cent<br>Abscessed |
|---|-------------------|------------------------|----------------------|-----------------------|
| Typical—5 symptoms in<br>chronological order  | 84.0              | 87.0                   | 85.4                 | 86.1                  |
| Typical—except no history<br>of nausea or nausea and<br>vomiting                              | 7.0               | 8.7                    | 10.9                 | 4.5                   |
| Typical—except absence of<br>fever on admission   | 8.1               | 4.0                    | 3.7                  | 9.4                   |
| Typical—except no history<br>of nausea or nausea and<br>vomiting and no fever<br>on admission | 1.9               | 0.3                    | 0.0                  | 0.0                   |

to bacterial invasion. The invasion takes place in the bottom of one or more of the follicles at the junction of the mucosa and submucosa and extends through the wall of the appendix. Foreign materials, especially fecaliths, are often factors which contribute to the introduction of bacteria into the walls of the appendix. Appendicitis often follows acute infections in other parts of the body, such as tonsillitis. The colon bacillus, streptococcus and pneumococcus are among the bacteria most frequently causing septic appendicitis. The rapidity with which the destruction of the appendiceal walls takes place is generally in proportion to the virulence of the infection.

Appendicitis is the most common acute pathologic condition found in the abdomen. Careful analysis of its symptoms, particularly in the early stages, is of extreme importance. Murphy, in 1909, stressed the value of the chronological order of symptoms in acute appendicitis. First, abdominal cramp-like pain around and above the umbilicus; second, nausea or nausea and vomiting, appearing in a few minutes to several hours; third, localized tenderness within





12 hours, accompanied by slight elevation of temperature and pulse. This cycle of symptoms takes place in from 2 to 12 hours in 90 per cent of the cases (Tables I and II). Deaver emphasized this order and worked out the causes, showing why the symptoms occur in the way they do. Babcock,<sup>1</sup> in 1935, and Kalteyer,<sup>2</sup> in 1937, called attention to and further stressed the chronological order of symptoms as described by Murphy and Deaver.

Deaver, Hurst, Pollock and Davis, and McKenzie have shown that the first pain, which is cramp-like, is produced by the contraction of the appendiceal walls. The pain is transmitted through the splanchnic nerves to the spinal cord and enters the cord through the posterior roots of the sixth through the twelfth dorsal nerves inclusive, continuing along the sensory paths of the cord to the sensory centers in the brain. Gatch,<sup>4</sup> in his recent work, has shown that nausea is due to the rhythmic contraction of the stomach walls; and that when vomiting takes place, there must be, in addition, contraction of the abdominal muscle.

TABLE III

*Acute Cholecystitis with and Without Stones—Study of 45 Cases from 1943 to 1946 with Best Data*

| Age                                     | Frequency | No.              | Per Cent |
|---|-----------|------------------|----------|
| 20-25 years                             | 7         | White Males 12   | 26.6     |
| 26-30                                   | 6         | White Females 33 | 73.4     |
| 31-35                                   | 3         |                  |          |
| 36-40                                   | 3         | 45               |          |
| 41-45                                   | 2         |                  |          |
| 46-50                                   | 8         |                  |          |
| 51-55                                   | 6         |                  |          |
| 56-60                                   | 5         |                  |          |
| 61-65                                   | 4         |                  |          |
| 66-70                                   | 1         |                  |          |
|   | 45        |                  |          |
|   |           | No.              | Per Cent |
| History of pain.....                    |           | 45               | 100      |
| pain radiating to back.....             |           | 21               | 46.6     |
| nausea and vomiting.....                |           | 42               | 93.3     |
| tenderness in right upper quadrant..... |           | 45               | 100      |

The all important factor in acute abdomens is the diagnosis, and, once made, surgery is the treatment with few exceptions, i.e. acute pancreatitis. All acute abdomens are amenable to operation if the

surgery is done at the proper time. Procrastination, regardless of its reason (inability, ignorance, indecision or wishful hoping), is the most frequent cause of postoperative morbidity, sequelae and death. Appendectomies should be done as soon as the diagnosis can be made. Chemotherapy may be used in the first few hours, before necrosis takes place. Few patients are seen in that phase, and in the very virulent infection the thrombosis of blood vessels occurs within the first 12 hours. It would be hazardous to depend on chemotherapy after gangrene has begun. The incision is made over the point of greatest tenderness and through the incision the field is surveyed. If the appendix is free, it is delivered; and if it is adherent, the incision is enlarged. The appendix is packed off and removed, if possible. Drainage is established in those cases in which it is felt that the appendiceal bed or the surrounding structures are not relatively free from infection. Microsulfathiazole solution and 500,000 units of penicillin are instilled in the abdomen through a rubber tube which is placed in the operative field before the abdomen is closed. A thin rubber drain is left in those cases requiring drainage and 100,000 units of penicillin are given intramuscularly every 3 hours until in our opinion it is no longer needed.

#### ACUTE CHOLECYSTITIS WITH AND WITHOUT CHOLELITHIASIS

There were 413 cases of acute gallbladder disease operated on at Norwood Hospital from 1923 to 1947 (Table III). Patients with acute gallbladder diseases, as a rule, do not come to surgery as early as those with acute appendicitis. In our opinion the delay is due to the fact that gallbladder surgery is considered more serious by the physician and the patient, and this fact is probably the reason why more patients refuse surgery than do those patients with acute appendicitis. The majority do not call the physician until the third or fourth day unless they have continued to grow worse, and often by this time gangrene has occurred. At least 90 per cent of acute gallbladders are produced by obstruction from stones in either the ampula of the gallbladder or the cystic duct. Cholecystectomy, which is the present day operation of choice, should carry as low a mortality rate as appendectomy, if and when physicians and patients have been educated as to the importance of gallbladder disease as they have been to the importance of appendicitis. When it is fully realized that an early operation before serious pathologic changes develop is as important as it is in appendicitis, the end results will be equally as good.

The first symptom of cholecystitis is a sudden moderate or severe pain. This pain is intermittent at first due to the muscular contrac-

tion of the gallbladder. The pain is located in the region of the gallbladder at the costal margin and often radiates to the scapular region. There may be nausea or nausea and vomiting if the stomach is not empty. If the stone remains impacted in the ampula or cystic duct, the pain becomes continuous, but different in character, and tenderness develops over the gallbladder. The temperature is usually higher than in appendicitis, being on the average 102° F. If there has been delay for any reason before the surgeon sees the patient, there may be marked liver damage, peritonitis or gangrene with perforation. There is usually a high leukocytosis with high polymorphonuclear neutrophilia. After the contents of the gallbladder become septic, the patient frequently has chills. Twelve per cent of patients in this series on admission had gangrenous, often phlegmonous, and sometimes ruptured gallbladders. An acute gallbladder is just as amenable to early surgery as is appendicitis.

I still use the longitudinal incision but some of my staff prefer the transverse incision. It is not possible in acute cholecystitis to leave any serous coat from the gallbladder to cover the gallbladder bed. I have found that if one grasps the gallbladder between the thumb and fingers of the right hand, with slight pressure, the acute or gangrenous gallbladder will shell out into one's hand. I have found some gallbladders already separated from the liver. Next the cystic duct is clamped with three clamps, care being taken that the clamps do not include any part of the common duct. Then the duct is excised between the distal and middle clamps. The stump is ligated. The distal end of the gastrohepatic ligament is freed and sutured to the stump, and this is fixed in the gallbladder bed with interrupted catgut sutures. The omentum can be used to fill in and help cover the raw surfaces. This will prevent the colon and the pylorus of the stomach from becoming adherent, which they are prone to do. A drain is always used. The common duct is opened and explored if there are indications for doing so.

#### ACUTE INTESTINAL OBSTRUCTION

There were 182 patients with acute intestinal obstruction who underwent operation. It is well to know whether the patient has had a previous operation.

The primary symptom of intestinal obstruction is cramp-like pain which is most frequently referred to the midabdomen. The nearer the obstruction is to the stomach, the more severe is the onset of the symptoms. The vomiting is earlier and the toxicity is greater in high obstructions due to the early regurgitation of very toxic materials from the upper ileum, jejunum, duodenum, into the stomach.

Cramping, the initial symptom, is followed by increased peristaltic waves, nausea and vomiting, without fever but with a fast pulse and often with shock. If there is any delay in relieving the obstruction, the symptoms are aggravated and there will be fecal vomiting. The patient goes into severe shock and the peristaltic waves are obliterated due to the paresis of the bowel caused by its over-distention. A thorough examination should be made for incarcerated herniae of all types. X-rays of the abdomen and chest may frequently aid or make a diagnosis of the point of the obstruction.

The following table shows the number of cases tabulated as to the cause of the obstruction.

TABLE IV

*Acute Intestinal Obstruction*

|  |               |
|--|---------------|
| Patients operated on for acute intestinal obstruction..... | 182           |
| Due to adhesions .....                                     | 97            |
| from abdominal abscess.....                                | 4             |
| from diverticulitis .....                                  | 17            |
| from other causes.....                                     | 76            |
| Due to hernia .....  | 42            |
| Due to intussusception .....                               | 32            |
| Due to malignancy .....                                    | 6             |
| Due to volvulus .....                                      | 5             |
| Mortality percentage .....                                 | 41.2 per cent |

These figures represent all classes of patients. A large percentage of them were admitted in a moribund condition, some with peritonitis from rupture. All had surgery after careful preparation and treatment for shock. No surgery except decompression was ever done, other than to clip a band of adhesions, until the patient's general condition justified it. When the patient's condition will permit, some type of reconstructive surgery has to be done. A good colostomy gives far more comfort than a poorly functioning rectum.

## RUPTURED PEPTIC ULCERS

The crater-like architectural pattern of the peptic ulcer is such that the diameter of its base is the same as the diameter of its mouth. Peptic ulcers frequently rupture. If the rupture is behind the peritoneal covering of the duodenum or posterior wall of the stomach, the symptoms may be those of pylorospasm and may be relieved by antispasmodics and antacids. If the musculature of the duodenum or stomach has been destroyed down to the serous coat when the ulcer ruptures, the perforation is in the nature of a blow-



out and, as a rule, the perforation is equal in size to the opening of the mouth of the ulcer. In all probability the size of the perforation is due to the severe contraction of the musculature of the walls of the stomach and duodenum. This lets the secretion and contents

TABLE V

*Ruptured Peptic Ulcers—Detailed Study of 59 Cases with Best Data*

| Duration of perforation<br>to operation                | Improved | Died | Total |
|--|----------|------|-------|
| 2 hours .....  | 2        | 0    | 2     |
| 4 .....  | 10       | 0    | 10    |
| 8 (a large percentage on borderline)....               | 17       | 3    | 20    |
| 12 .....   | 12       | 2    | 14    |
| 24 .....   | 6        | 1    | 7     |
| 48 .....   | 2        | 2    | 4     |
| 72 .....   | 1        | 0    | 1     |
| Over .....   | 1        | 0    | 1     |
|  | 51       | 8    | 59    |
| Mortality of cases operated on within 8 hours was..... |          |      | 9.6%  |
| Mortality of cases operated on over 8 hours was.....   |          |      | 17.9% |
| Onset began with severe pain.....                      | 59       |      | 100%  |
| History of nausea and vomiting.....                    | 42       |      | 74%   |
| No history of nausea and vomiting.....                 | 17       |      | 26%   |
| History of tenderness with marked rigidity.....        | 59       |      | 100%  |

of the stomach and duodenum escape into the peritoneal cavity. The primary symptom of a ruptured peptic ulcer is sudden, severe, agonizing pain. When this occurs the patient in most cases will grab his abdomen with both hands and sit down. The abdominal muscles becoming rigid is nature's effort to splint the abdomen and to limit respiratory movements and other movements of the body. The patient has to be carried from the place where he is stricken, if it is possible for him to get help. If the stomach is full, the patient will vomit. The severe agonizing pain, when the rupture occurs, is caused by the escape into the peritoneal cavity of the irritating secretions of the stomach or duodenum. The greater the spill, the more agonizing the pain will be. Symptomatology progresses in direct proportion to the development of peritonitis. There are few things that can be confused with ruptured peptic ulcers. Here the history makes clear the diagnosis. The time element plays a large role in the patient's recovery. Fortunately, the symptoms are so severe that most patients have to seek immediate relief and if there is no procrastination on the part of the physician who first sees him, the patient should get early surgical attention.

TABLE VI  
*Ruptured Peptic Ulcers—Incidence and Mortality*

| Year                       | Number of<br>Operations | Deaths |
|----------------------------|-------------------------|--------|
| 1923                       | 2                       | 2      |
| 1924                       | 4                       | 3      |
| 1925                       | 1                       | 1      |
| 1926                       | 3                       | 2      |
| 1927                       | 5                       | 1      |
| 1928                       | 8                       | 5      |
| 1929                       | 6                       | 0      |
| 1930                       | 5                       | 2      |
| 1931                       | 3                       | 1      |
| 1932                       | 7                       | 2      |
| 1933                       | 3                       | 1      |
| 1934                       | 2                       | 1      |
| 1935                       | 5                       | 2      |
| 1936                       | 1                       | 0      |
| 1937                       | 9                       | 2      |
| 1938                       | 5                       | 1      |
| 1939                       | 11                      | 2      |
| 1940                       | 8                       | 0      |
| 1941                       | 8                       | 5      |
| 1942                       | 15                      | 4      |
| 1943                       | 8                       | 2      |
| 1944                       | 9                       | 2      |
| 1945                       | 8                       | 1      |
| 1946                       | 6                       | 0      |
|                            | 142                     | 42     |
| Mortality percentage 29.5. |                         |        |

We have resected all of our ruptured ulcers and then reinforced them by tacking omentum over the suture line. A careful toilet is made of the contaminated portion of the abdominal cavity. If the contamination has not been too great, the cavity is not drained. A tube is always left in the incision with the end of the tube over the repair of the ulcer. Microsulfathiazole and penicillin are put in the abdomen and the tube withdrawn. Penicillin is given intravenously 50,000 units every 3 hours, and the patient is placed in an oxygen tent, negative pressure continued and proctoclysis instituted. Our mortality rate in patients operated on during the first 8 hours after perforation has been 31.5 per cent. (Table VI.)

#### ABORTION AND RUPTURED ECTOPIC PREGNANCY

Ruptured ectopic pregnancies include rupture of the tubes and tubal abortion. A careful menstrual history is one of the most im-

portant factors in making a diagnosis. There is always a missed menstrual period. Uterine bleeding may come on within 10 days after the regular period should have occurred and may lead the patient to say she has not missed a period but was only a few days late. This intermittent bleeding frequently continues. Then after a period of from one day to two or more weeks, there is a sudden, severe pain in the lower abdomen followed by tenderness in the lower abdomen, especially on the side of the pregnancy. There are early symptoms of shock: faintness and sweating. The symptoms are more severe in the rupture than in the abortive type. Shock is in direct proportion to the amount of hemorrhage. There is a chemical peritonitis with tenderness. Sometimes there is pain in the region of the clavicle when the hemorrhage gravitates up to the diaphragm. In ruptured ectopic pregnancies the history and physical examination play a very important part. On vaginal examination one finds tenderness when one presses against the cervix and a full feeling in the pelvis which is in proportion to the amount of hemorrhage. A mass may be felt if there is sufficient relaxation in the region of the affected tube. Most frequently the mass is sausage-shaped. Here, too, the time element is very essential to the welfare and recovery of the patient. Surgery is necessary regardless of the patient's general condition. If her condition is bad, blood and other solutions should be given intravenously and the patient prepared as quickly as possible for operation. Under general anesthesia, the abdomen is opened, the blood salvaged and given as autotransfusion. The bleeding tube is clamped and removed.

#### ACUTE MECKEL'S DIVERTICULUM

We have on record 6 operative cases of acute Meckel's diverticulum from Jan. 1, 1923, to Jan. 1, 1947. In every instance the patient gave all the chronological symptoms of acute appendicitis, and in all of these cases except one, a preoperative diagnosis of acute appendicitis was made. One of the 6 cases was that of a little girl from whom I had removed an acute gangrenous appendix 7 days previously. The day she was to leave the hospital, she developed another attack which gave all the chronological symptoms of acute appendicitis. This is the only case in which a preoperative diagnosis of acute Meckel's diverticulum was made. The patient was operated on and a Meckel's diverticulum which was becoming gangrenous was removed. We want to add one more case that was operated on in January, 1947, and was not included in this series. A child was diagnosed preoperatively as having a ruptured peptic ulcer in a Meckel's diverticulum. This child was under the observation of our pediatrician and had had several repeated attacks of

colicky pain which was not characteristic of appendicitis. She had had bleeding from the bowel during the last attack and had developed peritonitis. In this case the pediatrician made a diagnosis of an acute ruptured peptic ulcer in a Meckel's diverticulum. At operation the diagnosis was confirmed. With the aid of sulfonamides, penicillin and drainage of the abdomen, the patient made an uneventful recovery.

#### RUPTURED FOLLICULAR CYSTS OF THE OVARY

Ruptured follicular cyst of the ovary is one of the most confusing of acute abdominal conditions. The pain may be severe but is always sudden in onset and begins in one of the lower quadrants of the abdomen. The right ovary is more frequently affected and the symptoms are often confused with those of appendicitis. There is muscle spasm and tenderness; seldom any nausea or vomiting. The leukocytosis is that of acute appendicitis, a high polymorphonuclear cell count. It is more frequently diagnosed incorrectly as acute appendicitis than any other acute condition of the abdomen. A carefully taken history will reveal that the onset is usually about 5 to 15 days before the next menstrual period. These patients' symptoms subside in 24 hours if the hemorrhage has not been large, although some tenderness and soreness in the region of the ovary remains for 3 or 4 days. These patients are more often operated on for acute appendicitis than any other except acute Meckel's diverticulum. Sometimes the hemorrhage will be great and the patient in severe shock. Two patients were admitted in severe shock. Both were diagnosed as abdominal hemorrhages and had to be transfused (auto-transfusion) during the operation. No lesion was found in either case except a ruptured follicular cyst.

#### ACUTE PELVIC INFLAMMATORY DISEASE

Acute pelvic inflammatory conditions are not so difficult to differentiate from acute abdominal conditions if the proper history is taken and a careful physical examination made while the infection is confined to the pelvis. The onset of symptoms is gradual. A bimanual vaginal examination and vaginal smears should be made. Vaginal examination causes pain when the cervix is pressed upward. Often masses can be felt. The picture is changed when the general abdominal cavity becomes involved. Then there is generalized abdominal pain and distention. As long as the infection remains in the pelvis, the patient has very little discomfort in moving her body about the bed. If the appendix is in the pelvis or hanging over the rim of the pelvis, it may become involved but the classic symptoms of appendicitis will be absent.

## ACUTE PANCREATITIS

No disease is ushered in by a more stormy onset than acute pancreatitis, especially the hemorrhagic type. Since the development of urine and blood amylase tests, the diagnosis can be made with greater ease and certainty. Surgery is not advised.

## MESENTERIC THROMBOSIS

The onset of mesenteric thrombosis is sudden and severe with severe shock. If the ileum is involved, there is generalized tenderness over the abdomen. The tenderness will be in the area of involvement if it is in the colon. It has to be differentiated from acute pancreatitis and ruptured peptic ulcer. As the pathologic changes progress, the patient develops ileus, vomits and may pass bloody material from the bowels. At this stage a diagnosis can be made in about 50 per cent of the cases.

## CONCLUSION

The acute abdomen is a daily problem to the general practitioner, pediatrician, internist, surgeon and gynecologist. We believe that 95 per cent of acute abdomens can be diagnosed if a proper history can be obtained and the physical examination is properly made. The first consideration in an acute abdomen must be to determine the nature of the condition at the time of the patient's first symptoms. Past history should not be delved into until a complete history of the present illness has been taken and present physical findings determined. What the surgeon wants to know is what the patient has now; not what he has had. By this I do not mean that a past history should not be obtained; but if it is obtained along with the present illness, it can be very confusing and misleading to the young surgeon. The first conclusion one should try to reach is whether or not one is dealing with a surgical abdomen. No patient with an acute abdomen should be left until the surgeon has reached a definite conclusion as to the type of treatment the patient is to receive. Chemotherapy should not be used in patients with acute abdomens except during or after operative procedures. The use of chemotherapy can be dangerous, for even though the patient has been seen soon after the onset of symptoms, thrombosis of the blood supply to the affected area with necrosis, or the accumulation of pus, may already have taken place in the more virulent infections. Although chemotherapy seldom does much to relieve such conditions, as an adjunct to surgery it may be a great benefactor to both surgeon and patient.

In closing, I wish to reemphasize the importance of a careful history when it is possible to obtain such. There should be a careful



physical examination and a quick determination of findings followed by an early operation if the diagnosis of an acute surgical abdomen has been made. When there is reasonable doubt, surgery should be instituted. With the present day surgical technic in the hands of skillful operators, the patient takes less chance by having a useless operation than by risking the occasional fatal termination resulting from not having the proper operation at the proper time. This is especially true in patients with perforated ulcer of the stomach or duodenum, gangrenous gallbladder or gangrenous appendix.

## FRACTURES OF THE FEMUR: NECK AND TROCHANTERIC REGION

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**F**RACTURES in the neck and trochanteric regions of the femur still, though the results of treatment are much better, might be referred to as the "unsolved fracture." Surgical literature was, for a time, filled with articles referring to treatment of fractures of the neck of the femur and this period was followed by one in which much writing was done on fractures in the trochanteric region. These variable periods were brought about by surgeons taking stock of their results and introducing their individual methods of treatment in an effort to better their results. There are almost as many methods of treatment of these fractures as there are authors writing on the subject. A résumé of these methods will not be given but the method or methods which we use will be discussed, and some of the problems which we have in treating these fractures will be discussed and illustrated.

The anatomy of especial importance pertaining to the area involved in the fractures under discussion is that of the blood supply to the head and neck of the femur and the relationship of the capsule to the joint and femoral neck. The blood supply is classically stated as coming to the head and neck from the artery which accompanies the ligamentum teres of the hip and from the branches of the profundus femoris. The branches from the profundus femoris are the nutrient artery to the femur and the anterior and posterior circumflex femoral vessels. The last two vessels reach the head and neck through the capsule of the hip joint. There has been and still is much discussion as to the importance of the artery of the ligamentum teres as a source of blood supply to the head and neck of the femur. De las Casas, after studying fresh specimens both grossly and microscopically, concluded that there is no vessel with the ligament which could be depended upon to carry any blood supply. He found that this artery was of even less importance in the aged than in the younger age group. In direct opposition to these findings are those of Pacini and Rizzi, who studied 150 round ligaments and found that there was a definite blood vessel accompanying the round ligament into the head of the femur and that it, in adult life, enters

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into the circulation of the bone by anastomosing with the circumflex vessels. They, in contrast, found that the vessel enlarges throughout life and supplies a larger area of the bone in adults than in infancy or adolescence. During the latter period the vessel was found to supply only an area around the foveae. The capsule of the hip joint extends anteriorly to the intertrochanteric line but posteriorly it only covers the proximal one third to one half of the neck. This anatomic feature, as has been pointed out by Sir Astley Cooper,

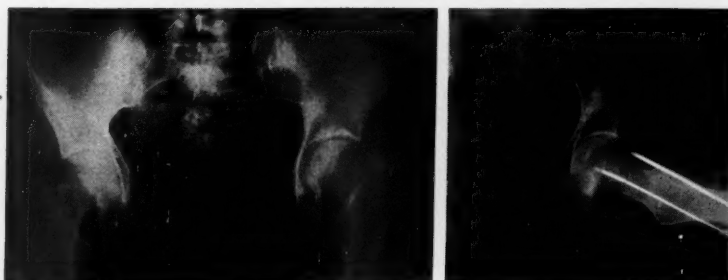


Fig. 1. Lateral type fracture of the neck of the femur before reduction.

Fig. 2. Lateral view with guide pin and guide wire in place. Lateral view made by flexing hip and knee and abducting the upper leg.

Phemister and others, is important in the union of fractures in this region. The other salient feature of the anatomy, other than the structural architecture of the bone in the region of the trochanters and neck and head of the femur, has to do with the angle of the neck to the shaft which is normally 120 to 130 degrees with a smaller angle in females supporting their broader pelvises.

Fractures of the neck of the femur are peculiar in that they do not unite as fractures of long bones. Kuloskwi et al, in a pathologic study of fractures of the neck, found an absence of cartilage from the healing process at the site of fracture as well as an absence of subperiosteal reactions and peripheral callus.

In that the fractures occur in regions where there are many small muscles either passing beneath or attaching to the bone at a nearby point, there are frequent opportunities for soft tissue to be interposed between the fracture fragments. This led a number of surgeons to require open reduction of these fractures, especially those of the neck of the femur. This was based on operative findings in which they found a large percentage of cases with fragments of the capsule or of the nearby soft tissues and muscles interposed between the fracture fragments. The good results from closed reduction and internal fixation of fractures, especially of the neck, have increased

to the point where we feel that this is the method of choice in their treatment.

Trochanteric fractures are a different problem in that they are usually much more comminuted than are those of the neck of the femur. The cortex along the outer surface of the trochanter and the shaft of the femur is very thin and does not hold materials used in fixation very well. For this reason we feel that the White method, using a modified Smith-Petersen pin and a Thornton plate, is the method of choice in their treatment.

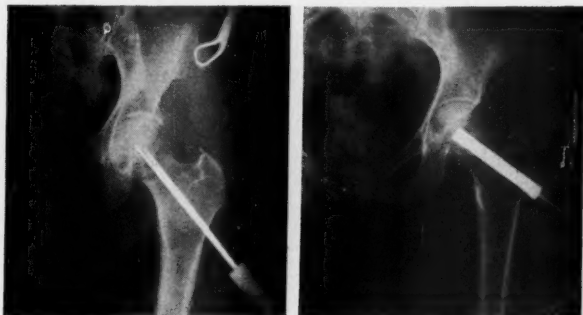


Fig. 3. AP view with guide pin and guide wire in place after fracture has been reduced.

Fig. 4. Smith-Petersen nail threaded on guide wire and partially driven into neck of femur. The position of the guide wire is thereby checked to insure against its being driven further into the bone or becoming bent while being driven into place.

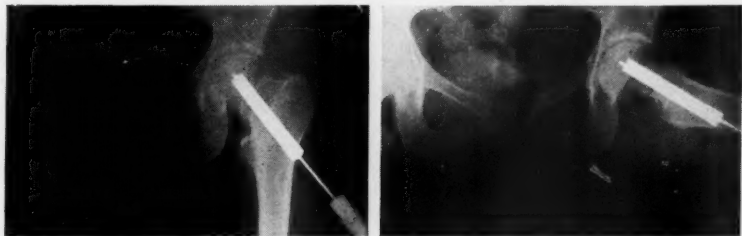


Fig. 5. Steinmann pin driven into head of femur prior to impaction of fracture fragments.

Fig. 6. Lateral view after pin has been driven into the head of the femur.

In all of these fractures, an essential to correct treatment is accurate reduction. This may be attained in any way which will produce the desired results. McElvenny has recently pointed out that the Leadbetter palm test is unreliable for testing reduction. He

states that to have a good reduction the neck must be inside and below the head fragment. In fractures of the neck of the femur this, in our hands, has been attained by anesthetizing the patient (preferably with spinal anesthesia) and reducing the fracture by traction in a slightly abducted and externally rotated position until there is no shortening in the extremity involved and the neck is felt to slip by the femoral head. The leg is then internally rotated to approximately 30 degrees. We have not found it necessary to rotate the extremity until "the patella is pointing directly medially and the internal condyle of the femur directly posteriorly." X-ray examination is essential in checking the reduction and this must be in both the anteroposterior and lateral positions. In treating fractures of the neck of the femur we use the Larsen method of inserting the Smith-Petersen nail. This is illustrated in Figures 1 through 6. This, briefly, is done by reducing the fracture and placing a Steinmann pin along the anterior neck of the femur (fig. 2). This is done under fluoroscopic control. The guide block, carrying a trocar, is then placed in such a position as the guiding Steinmann pin would indicate. In that the leg is internally rotated, the neck of the femur is approximately parallel with the table top and the block is permitted to hang from the guiding pin. There are two holes in the block below the hole carrying the guide pin. In patients of normal size, the hole nearest the guide pin carries the trocar, whereas in heavy or large individuals, the second hole is used for this purpose. The trocar is placed against the shaft of the femur just below the trochanter and the cortex is perforated by striking the trocar. The obturator of the trocar is then removed and the guiding wire is drilled into position. This is all done under fluoroscopic control. When the guide wire is in position, anteroposterior and lateral films are made (figs. 2 and 3). The lateral view is obtained by flexing and abducting the injured hip. If the guiding wire is in a satisfactory position, an incision over the lateral aspect of the thigh just large enough to admit the Smith-Petersen nail is made, and the nail is threaded over the guiding wire and driven into position. Checks are made during this procedure (fig. 4) to see that the guiding wire has not become bent nor driven through the head of the femur. To date, we have not had the guiding wire to bend as has been reported by others. After the nail is in place the fracture is impacted (fig. 5). A perforated Smith-Petersen impactor is used to drive the nail into the bone. If the fracture is of the neck of the femur, a skin clip or a single suture is used to close the incision. In the selection of the nail to be used, the impaction should be taken into consideration for if the nail is the exact length of the neck of the femur, the process of impaction will push it through the head of the femur





Fig. 7. Film showing medial type fracture of neck of the femur prior to reduction.

Fig. 8. Lateral view of Smith-Petersen nail in place. This is not a perfect application in that the nail is in the lower portion of the neck of the femur.



Fig. 9. Medial type fracture of the neck of the femur after reduction.

Fig. 10. AP view after Smith-Petersen nail has been driven into the head of the femur.



Fig. 11. Lateral view after the pin has been driven into the head of the femur.

into the acetabulum. The Steinmann pin which is used as a guiding pin is marked at one half inch intervals and the length of the nail can be obtained by a summation of these markings, or another wire

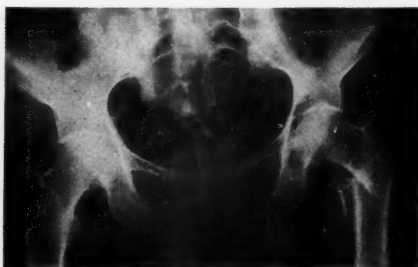


Fig. 12. Intertrochanteric fracture of femur before reduction.

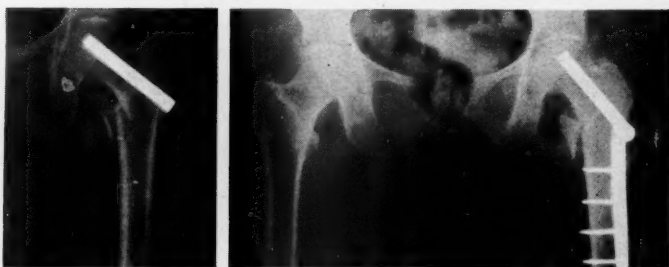


Fig. 13. Intertrochanteric fracture after partial reduction and with Smith-Petersen nail driven into the neck and head of the femur.

Fig. 14. The same fracture after the application of a Thornton plate. Fracture fragments are in good position.

ten and one half inches long (this is the length of the guiding wire) can be placed alongside the inserted guide wire with its tip against the shaft of the femur, and the difference in the apparent length of the two wires is the proper length of the nail.

This type of treatment is used in all fresh fractures of the neck of the femur (figs. 7 through 11). Dawkins, McMurray, Hatton, Putti, and many others still advocate trochanteric osteotomy for the subcapital or medial type fractures of the femoral neck. They point out that complications such as aseptic necrosis, non-union, etc., are adequately treated by this method. Dawkins does not think that age is a contraindication for plaster treatment which would be necessary following the osteotomy. The cast used in this form of treatment would not have to stay on for more than 3 or 4 months, and he points out that in methods using internal fixation, weight-bearing is usually limited for a longer period of time than 3 or 4 months. In fractures which are not fresh and in which there is

reason to believe from x-ray study that there is some necrosis in the head of the femur, we agree that this is the treatment of choice.

Hart emphasizes the type fracture of the femoral neck determines the result to be expected following treatment. In the abduction type with impaction, the stress is in line with the fracture and union can be expected, whereas in the adduction type, the shearing force produced by muscle pull, weight-bearing, etc., causes motion at the



Fig. 15. Badly comminuted intertrochanteric and subtrochanteric fracture of femur.

Fig. 16. Fracture satisfactorily reduced following skeletal traction. The position of Steinmann pin in the lower part of the femur is shown.

fracture site with hyperemia, decalcification, a tendency to absorption of the neck, necrosis of the head, and a poor result. This is the type fracture which must be adequately reduced and firmly fixed to prevent the above changes and events from taking place.

In treating trochanteric fractures, the modified Smith-Petersen nail is put into the neck of the femur as discussed above (figs. 12 and 13). A lateral incision, extending from the great trochanter for approximately 6 inches down the lateral surface of the leg, is made and the femur exposed by dividing the muscles overlying the bone. A Thornton plate is fixed to the femur, bridging the fracture site, after the plate has been attached to the nail (fig. 14). The fracture is thereby fixed in such a position that the leg is in slight abduction. The wound is then closed. Cashberg points out that if the best result with any type of fixation in this type fracture is to be obtained, it is important that there remain a piece of the great trochanter on the distal fragment in order that you may have some bone which may be depended upon to hold the fixation apparatus. In some cases, there is so much comminution that it is im-

possible to get any kind of purchase with fixation material (fig. 15). In these cases intermedullary fixation, the Whitman abduction cast method (fig. 17) or continuous traction (fig. 16) must be used.



Fig. 17. The same fracture after application of cast. It is noted that there has been some slipping of the fracture fragments.

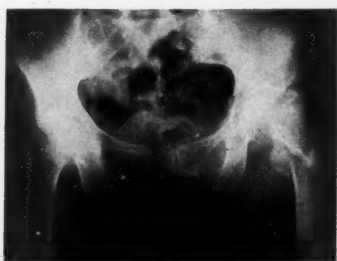


Fig. 18. Intertrochanteric fracture of femur before reduction.

Fig. 19. The same fracture after reduction and application of a Smith-Petersen nail and a Thornton plate. The great trochanter has been wired to the distal fracture fragments.

Johnson has recently reported 50 cases of intertrochanteric fractures treated by the principle of a hanging cast. His results were good in that he had a 54 per cent reduction of mortality rate, no instances of non-union, the reductions were as satisfactory as in any other form of treatment previously used, there was a lack of complications such as stiff knee joints, etc., and there was a reduction in time necessary for bony union to occur. This form of treatment might well be used in the severely comminuted fractures in which internal fixation can not be efficiently applied.

In fractures which have features of both subtrochanteric and intertrochanteric fractures, we have followed the principles of treatment set out above (figs. 18 and 19). We find that the modified

Smith-Petersen nail with a Thornton plate is a more adequate means of fixation than a simple plate bridging the site of fracture. In lateral type fractures of the neck of the femur, a similar form of treatment can be used, though in most instances a Smith-Petersen nail is all that is necessary.



Fig. 20. AP view of an old medial type fracture of the neck of the femur showing aseptic necrosis of the head of the femur with non-union of the fracture of the neck of the femur and an absorption of the neck of the femur and a Smith-Petersen nail which has been pushed or has slipped out of its original position.

In the postoperative care of these patients, no external fixation of the fracture is used. The patient is put into a wheel chair as quickly as possible and that is usually on the first postoperative day providing there are no associated injuries or other contraindications to this. While in bed, the leg is protected from twists and other undesirable movements by pillows. Crutches are given the patient, but the injured leg is kept from all contacts which could lead to weight bearing, but the knee motions and the use of the muscles of the leg are encouraged. We have, to date, permitted no weight-bearing for 6 months, or until there is adequate evidence that trabeculae are firmly re-established and demonstrable in x-ray. Venable points out that posture of the patients in the postoperative period is very important for if they are permitted to walk or swing their legs in abduction they create a fulcrum on top of the fracture which causes the nails to work out. He points out that the position of rest to the femoral neck is with the inner condyle of the femur in line with the anterior-superior spine of the ilium.

In treating fractures of the neck of the femur and trochanteric regions, complications are frequent. In some cases bony union is apparent, yet in 6 to 18 months the patient develops a painful hip and has a limitation of motion in the hip. This is frequently attributed to posttraumatic arthritis but, as Cleveland, Phemister, Speed, and others have pointed out, this is usually due to aseptic necrosis

of the head of the femur. Cleveland states that this type of late circulatory change is more frequent in patients who have open reduction of their fractures. Incomplete reduction, regardless of method of treatment, is conducive to this type change.



Fig. 21. AP view of a medial type fracture of the neck of the femur with a Smith-Petersen nail in the femur but not extending into the head. There is a dead head and absorption of the neck of the femur with non-union of the fracture. This pin was put in at another hospital and because of the position of the pin and the apparent length of the pin it is doubtful whether or not the pin was ever in the head of the femur.



Fig. 22. AP view of an intertrochanteric and subtrochanteric fracture of the femur with a Smith-Petersen nail and a Thornton plate in position, but the Thornton plate has been bent just below its attachment to the Smith-Petersen nail.

All types of things can happen to the fixation materials. Bosworth has reported a broken pin in which one piece had to be removed from "in front of the bladder." Loosening of the nail is a frequent complication (fig. 20) and it may even pull out of the head (fig. 21). Speed points out that this comes from improper application but in most instances is due to too early strain placed on the approximated bone fragments by too early weight-bearing. Cleveland states that when a fracture is adequately reduced, firmly nailed, and



a bony union obtained, no migration takes place. In Figures 20 and 21 it is evident that there are non-unions with dead heads, thereby fulfilling Cleveland's dictum. Pretty has noted loosening of the nail



Fig. 23. An intertrochanteric fracture of the femur with a Smith-Petersen nail and a Thornton plate in position, but the Thornton plate has bent just below its attachment to the Smith-Petersen nail and the tap holding the plate to the nail has become loose.



Fig. 24. Intertrochanteric fracture of the femur with a Smith-Petersen nail and a Thornton plate in position, but the Thornton plate has become loose from the Smith-Petersen nail.

with a small triangular area of aseptic necrosis at the apex of the nail. In using Thornton plates, the plate may bend (fig. 22) or may become loose where it is attached to the Smith-Petersen nail (figs. 23 and 24).

Adventitious bursae, at times, developed over the heads of the nails. This can be corrected by excising the bursae or removing the nails. Speed has recently reported 7 cases of infection in the neck of the femur following internal fixation. This is an important complication which is too frequently completely disregarded by men using this procedure.

When fractures are treated as above outlined the results are gen-

erally excellent. The fracture committee of the Academy of Orthopedic Surgeons reported union in 89.4 per cent of cases and a mortality rate of 8.5 per cent in cases treated by internal fixation of fractures of the neck of the femur. In trochanteric fractures the mortality rate is greatly reduced through mobilizing the patient early and therefore preventing death from causes produced by long periods of bed rest in the aged. Union in the latter type fracture has never been a great problem. The method outlined is one which will get the patients up early, permitting their fractures to heal while they are at least partially ambulatory. In some cases of known non-union the functional results have been excellent. In some of the cases in which good bony union has occurred, function has been poor. This is disheartening to both patient and surgeon; however, until, as Darrach has suggested, biochemistry assists us in explaining why certain changes occur, we can not expect much better results.

#### SUMMARY

Our experience in the treatment of fractures of the neck and trochanteric regions of the femur has been discussed. We believe that internal fixation of fractures of the femoral neck, using the closed method of treatment, is the one of choice. We use the Larsen method of placing the Smith-Petersen nail because of its simplicity and accuracy. Fractures in the trochanteric region are treated by placing a Smith-Petersen pin in the neck of the femur and attaching to it, bridging the fracture site, a Thornton plate. In badly comminuted fractures in the trochanteric region, some other method of treatment must be used due to inability to gain purchase by fixation materials.

We have called attention to some of the frequent complications which occur in these fractures, namely, necrosis of the head of the femur, absorption of the neck of the femur, loosening of the Smith-Petersen nail in the femoral neck, loosening of the Thornton plate at its attachment to the Smith-Petersen nail, and bending of the Thornton plate. The development of better metals used in the construction of the Thornton plate will alleviate some of these complications.

A statistical analysis of our cases has not been presented but our results in 30 cases treated as discussed has followed closely that reported by other authors writing on this subject.

We recognize and use trochanteric and subtrochanteric osteotomy in the treatment of aseptic necrosis of the head of the femur and have obtained good results through the use of this method of treatment.

## BIBLIOGRAPHY

1. Anderson, R., and McKibbin, W. B.: Intertrochanteric Fractures, *J. Bone and Joint Surg.* 25:153-168 (Jan.) 1943.
2. Baughman, B. B.: Nailing of Fractures of Neck of Femur, *Kentucky M. J.* 40:303-309 (Aug.) 1942.
3. Caldwell, J. A.: Subtrochanteric Fractures of Femur, *Am. J. Surg.* 59:370-382 (Feb.) 1943.
4. Carothers, R. G., and Giannestras, N. J.: Intracapsular Fracture of Neck of Femur Treated by Internal Fixation, *Am. J. Surg.* 59:392-403 (Feb.) 1943.
5. De las Cases, H.: Treatment of Fractures of Femoral Neck in the Aged, *J. Internat. Coll. Surgeons*, March-April, 1942.
6. Casberg, M. A.: Use of Lag Screw for Internal Fixation of Intertrochanteric Fractures of Femur, *Surg., Gynec. & Obst.* 72:772-777 (April) 1941.
7. Cleveland, M.: A Critical Survey of Ten Years' Experience with Fractures of Neck of Femur, *Surg., Gynec. & Obst.* 74:529-540 (Feb.) 1942.
8. Couch, J. J.: Two Fractures of Neck of Femur, *Canad. M. A. J.* 43:31-34 (July) 1940.
9. Dawkins, A. L.: Treatment of Recent Fractures of Neck of Femur by Subtrochanteric Osteotomy, *Australian & New Zealand J. Surg.* 10:244-248 (Jan.) 1941.
10. Geckeler, E. O., and Tuttle, A.: Fractures in Neck of Femur—Accurate Subcutaneous Fixation with Screws, *Surg., Gynec. & Obst.* 72:100-111 (Jan.) 1941.
11. Ghormley, R. K., et al: Fractures of Femur, *Surgery* 15:887-893 (June) 1944.
12. Hamsa, W. R.: Intracapsular Femoral Neck Non-Union, *Surg., Gynec. & Obst.* 69:200-205 (Aug.) 1939.
13. Hart, V. L.: Fractures of Neck of Femur, *Surgery* 12:763-767 (Nov.) 1942.
14. Hermann, O. J.: Reconstructions in Non-United Femoral Neck Fractures, *Surg., Gynec. & Obst.* 70:403-407 (Feb.) 1940.
15. Holcomb, O. W.: Treatment of Intracapsular Fractures of Femur with Smith-Petersen Nail, *Minnesota Med.* 24:650 (Aug.) 1941.
16. Johnson, M. D.: Treatment of Intertrochanteric Fractures of Femur with a Hanging Cast, *Surg., Gynec. & Obst.* 77:598-600 (Dec.) 1943.
17. Kleinberg, S.: Fracture of Neck of Femur, *New York State J. Med.* 44:2460-2467 (Nov. 15) 1944.
18. Kubwiski, J., and Luck, J. V.: Microscopic Changes after Internal Fixation of Transcervical Fracture of Femur, *J. Bone & Joint Surg.* 23:17-22 (Jan.) 1941.
19. Larsen, B. B.: Insertion of Smith-Petersen Nail without an Initial Skin Incision, *Surg., Gynec. & Obst.* 77:187-192 (Aug.) 1943.
20. Lewis, K. M.: Use of Smith-Petersen Nail in Treating Fractures of Neck of Femur, with Observations on 58 Patients, *Surg. Clin. North America* 23:520-533 (April) 1943.
21. Magnuson, P. B.: Report of 59 Consecutive Cases of Un-united Fracture of Neck of Femur, *Surgery* 7:763-772 (May) 1940.
22. McElvenney, R. T.: Roentgenographic Interpretation of What Constitutes Adequate Reduction of Femoral Neck Fractures, *Surg., Gynec. & Obst.* 80:97-106 (Jan.) 1945.
23. McKibbin, W. B.: An Ambulatory Method of Treatment for Intertrochanteric Fractures of Femur, *Surg., Gynec. & Obst.* 76:343-346 (March) 1943.
24. McKibbin, W. B.: Trochanteric Fractures of Femur, *Northwest. Med.* 40:242-243 (July) 1941.
25. Morris, H. D.: Trochanteric Fractures, *South. M. J.* 34:571-578 (June) 1941.
26. Mullard, K. S.: Spontaneous Fracture of Apparently Normal Neck of Femur, *Brit. J. Surg.* 29:241-244 (Oct.) 1941.
27. Potts, W. J.: Operative Fixation of Fracture of Neck of Femur, *Illinois M. J.* 77:133-137 (Feb.) 1940.
28. Siler, V. E., and Caldwell, J. A.: Treatment of Intertrochanteric Fractures of Femur by Modification of Russel Balanced Traction, *Am. J. Surg.* 47:431-442 (Feb.) 1940.

29. Speed, K.: Management of Fractures of Neck of Femur by Operative Fixation, *Surg. Clin. North America* 20:75-96 (Feb.) 1940.
30. Stuck, W. G.: Treatment of Intertrochanteric Fractures, *Surg., Gynec. & Obst.* 78:104-105 (Jan.) 1944.
31. Taylor, G. M.; Neufeld, A. J., and Janzen, J.: Internal Fixation for Intertrochanteric Fractures, *J. Bone & Joint Surg.* 26:707-712 (Oct.) 1944.
32. Thatcher, H. H.: An Internal Fixation Device for Treatment of Intertrochanteric Fractures of Femur, *Am. J. Surg.* 60:44-49 (April) 1943.
33. Treatment of Fractures of Neck of Femur by Internal Fixation, *J. Bone & Joint Surg.* 23:386-390 (April) 1941.
34. Whitman, R.: The Salvaging of Fracture of the Femoral Neck, *Lancet* 1:378-380 (March 28) 1942.

## PROPYLTHIOURACIL IN TREATMENT OF GOITER

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**T**WO unsuccessful attempts to treat hyperthyroidism without the benefit of surgery have been made in medical history. The first of these was the use of x-ray therapy, which was soon discarded. This was followed by the introduction of iodine, in 1923, which also proved unsatisfactory.

Astwood, in 1943, after considerable experimental work in the United States and New Zealand, suggested thiouracil, a goitrogenic drug, in treatment of this condition. This product was finally released by the Council and following its indiscriminate use at least 25 deaths were reported in medical literature. There were probably others, which have not been reported. Toxic reactions as high as 14 per cent have been observed by numerous authors.

Propylthiouracil was developed and has been supplied to a limited number of doctors and clinics by the Lederle Laboratories during the past 3 years. Those who have had experience with the use of this drug must now report their results so that proper evaluation can be made of its true worth. It was hoped by some and prematurely reported as established that this new drug had, in addition to the capacity to reduce basal metabolism to normal, the property of producing a sustained remission of hyperthyroidism in a high percentage of patients. One year of continuous therapy was suggested as a means of effecting the desired results. Wider experience by many physicians soon indicated that prompt relapse of hyperthyroidism occurred in many cases following reduction of the dose, or withdrawal of the drug, regardless of the duration of the active treatment. In other cases, prolonged remissions would occur. These remissions are designated as hyperthyroid free periods and not as a cure. They have been reported most frequently in patients with mild hyperthyroidism and only slight enlargement of the gland. It has also been observed that the duration of the treatment has little to do with the duration of the remission so long as the basal metabolism is normal when the drug is withdrawn.

Actually, the basic etiology of hyperthyroidism must be determined before the relapse, or remission, as affected by antithyroid therapy is understood.

Maintenance therapy, to avoid thyroidectomy, carried with it certain disadvantages. It must be admitted, however, that carefully

regulated doses of these drugs will adequately control hyperthyroidism over a prolonged period of time. This entails periodic observation, which includes basal metabolism and blood studies, and in the event of intercurrent illnesses further adjustment of the doses may become necessary, as with insulin therapy in diabetes. There are many objections to permitting patients to continue in a state of partial control of hyperthyroidism, especially the older age group with cardiac involvement and those with psychotic tendencies, since these patients can ill afford further systemic depletion. Failure to accomplish complete control may be the result of inadequate observation or understanding of antithyroid therapy on the part of the physician, or the well recognized tendency of patients to alter, or discontinue, treatment of their own accord.

Other serious objections to maintenance therapy include such factors as:

- (1) Failure to produce a cure.
- (2) Persistence of goiter.
- (3) Inherent danger in not removing adenomatous goiters.
- (4) Possible reactions to the drug.
- (5) Possible development of serious histopathologic change in the thyroid gland.

Few patients are likely to choose prolonged treatment which in the end is not curative, when a satisfactory surgical approach is available. The continued presence of goiter, even though inactive, indicates potential trouble and tells the patient that he is not cured of his disease. Some investigators report as high as 22 per cent of malignant changes in abnormal thyroid glands. The possibility of a reaction is real, although small, and at no time during treatment can one feel entirely safe.

It has been shown that the development of cyst-adenomas in rats occur following prolonged administration of antithyroid drugs which appear to have malignant potentialities. As an adjunct to surgery, this drug can prove quite valuable and the following observations have been made: Subtotal thyroidectomy can be done without the risk of hyperthyroid reactions before or after operation. The basal metabolism should return to normal, or near normal. Signs and symptoms should disappear before surgery. It is advisable to maintain this level one month, or more, in patients of the older age groups, those of long duration, thyrocardiacs, depleted individuals and those with psychotic tendencies. Lugol's solution and propylthiouracil, simultaneously, will effect prompt improvement. This also reduces the vascularity of the gland in



preparation for an easy operation. Lugol's solution delays the response, but this is outweighed by the rapid clinical improvement.

In the past 4 years at the Lahey Clinic<sup>1</sup> in Boston 421 patients have been treated with propylthiouracil; 409 cases with other antithyroid drugs. There has been one death 2 days postoperatively due to coronary disease, a mortality of .12 per cent as compared with a mortality of 1.49 per cent with the use of antithyroid drugs. The two stage operation has decreased from 16 per cent to 1 such operation in the years 1946-1947.

The only serious objections to surgery are cord paralysis and tetany, which do not occur in over .5 per cent and these are surmountable. Myxedema, occurring in about 2 per cent, is easily controlled by desiccated thyroid and it may even be welcomed by those who fear return of symptoms of hyperthyroidism. The recurrence rate after 2 years of patients treated preoperatively with antithyroid drugs at the Lahey Clinic was 2 per cent. One half of these required re-operation and the remaining half were controlled with Lugol's solution. Therefore, 95 per cent cures with only tetany as a serious disadvantage following a subtotal thyroidectomy. Pregnancy does not constitute a contraindication to surgery.

It is generally agreed that mildly toxic patients with small glands may possibly be treated without surgery.

Jackson<sup>2</sup> has devised this type of treatment in children who have not reached puberty.

Other cases, in whom surgery is not advisable, such as pulmonary tuberculosis, may well be maintained in as near normal state as possible by this drug.

#### REFERENCES

1. Bartels, E. C.: Personal communication to the author, May 28, 1947.
2. Jackson, A. S.: Propyl Thiouracil in Treatment of Toxic Goiter, *Jackson Clin. Bull.* 9:12-15 (Jan.) 1947.

## SURGICAL TREATMENT OF HYPERTENSION

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**I**N September, 1945, the Surgeon General of the United States Army gave permission for lumbodorsal splanchnicectomy to be carried out on selected patients with arterial hypertension in certain designated vascular centers. This paper summarizes the experience on a group of patients from October, 1945, to April, 1947, studied and operated upon at Ashford General Hospital, White Sulphur Springs, West Virginia, until its closure and then at Walter Reed General Hospital, Washington, D. C. Since insufficient time has elapsed to evaluate fully the results of operation in all of these patients because of the exigencies of demobilization and hospital closure, the data presented cannot be considered conclusive but rather indicative of the effect of operation on hypertension.

The patients were all studied on the medical service and were then seen by members of the surgical service before the final decision as to operation was made. In general, the method of study and the criteria for selection of patients for operation were those of Smithwick<sup>1,2</sup> and will be described in detail below. Seventeen patients were operated upon, and 15 patients were followed from 4 months to one year. Two patients are only a few weeks postoperative, too soon for the blood pressure data to be of any significance. The ages ranged from 22 to 43, with an average age of 32. There were 16 males and one female. The known duration of the hypertensive state in these patients was from 5 months to 3 years, and all developed sustained elevated blood pressures while in the Army. The effect of the stress and strain of Army life, particularly combat, can only be inferred. It is to be pointed out that this may be a somewhat unusual though small group of patients in whom a rather rapidly developing and progressing hypertension in young individuals existed. The case reports below illustrate this point. Most of these patients had minimal or no symptoms; the value of careful blood pressure determinations at Army installations, particularly induction and separation centers, cannot be over-emphasized.

### METHOD OF STUDY

All patients with hypertension were studied on the medical service

in a routine fashion. Many patients were evaluated who were not operated upon; a few patients refused operation because of the lack of symptoms. Careful evaluation in a standard manner of the blood pressure responses of a hypertensive or hyperreactive individual is very important, and such data may be the decisive factor in determining a man's fitness for overseas duty. The cold and postural test described below has been found quite useful in this regard. The subject of variations in blood pressure under varying circumstances in relation to men in the Army will be discussed in detail in a separate communication.

In addition to a complete history and physical examination, the patients were studied from the standpoints of their blood chemistry, cardiac status, eyeground appearance, renal function, and blood pressure responses to stimulation and sedation.

The blood chemistry determinations routinely employed were urea nitrogen and serum protein. A Kahn test and a complete blood count were obtained on each patient.

In evaluation of the cardiac status, an electrocardiogram and 7 foot heart roentgenogram were done, and the patients were seen by the cardiologist.

The renal function was studied by means of several urinalyses, a 12 hour urine concentration test, an intravenous pyelogram, and an intravenous phenolsulphonphthalein test with specimens taken at 15, 30, 60, and 120 minutes. When indicated, urine cultures were taken.

The eyegrounds were studied by the eye consultant through dilated pupils. We have used Smithwick's classification,<sup>1</sup> which is a simple but very convenient one. Grade O is a normal fundus. Grade 1 includes any abnormality except arteriovenous nicking, hemorrhages, exudates, and papilledema. Grade 2 includes fundi with arteriovenous compression but without hemorrhages, exudates, or papilledema. Grade 3 includes fundi with hemorrhages or exudates, or both, but without papilledema. Grade 4 includes fundi with papilledema of all degrees.

The most important studies were those relating to the blood pressure responses. The patient's blood pressure was taken on admission to the hospital by the ward officer. Thereafter, daily determinations were taken by the nurses and recorded in the chart.

After the patient had been hospitalized for several days, the cold and postural blood pressure test was done. This test is Smithwick's modification<sup>1</sup> of the Hines-Brown cold pressor test and is performed in a routine standard fashion as follows: The patient was

taken to a quiet room and allowed to rest for half an hour on a comfortable bed. Readings of the blood pressure and pulse were then taken at one minute intervals for 5 readings with the patient lying in the supine position. These were repeated for 5 readings with the patient sitting on the edge of the bed, and were then repeated for 5 readings with the patient standing. The patient then reassumed the lying position and 5 readings again were taken. The opposite hand was then immersed in ice water and readings taken after 30 seconds and one minute, when the hand was removed. Readings were again taken at one minute intervals for 5 readings. The patient then assumed the standing position and 5 readings were taken. The hand was then immersed in ice water again and readings taken after 30 seconds and one minute. Five additional readings were then taken with the patient remaining in the standing position. When the data are charted, a graphic picture of the nature and magnitude of the hypertensive state of the individual is obtained. Figure 1 illustrates a typical chart in a hypertensive patient. It is the purpose of this test to obtain a basal blood pressure in the lying position and to bring out also the peaks of blood pressure in response to reflexes from simple though common stimuli, namely, posture and cold.

As a final test, the patient was given 3 grains of sodium amytal at 7, 8, and 9 p.m. (a total of 9 grains) and the blood pressure and pulse taken hourly from 7 p.m. to 7 a.m. and charted graphically. It was also noted whether the patient was awake, drowsy, or asleep.

#### INDICATIONS AND CONTRAINDICATIONS

For the purpose of standardizing comparisons of blood pressure from patient to patient and in the same patient from time to time, Smithwick<sup>1</sup> has used the average diastolic level with the patient in the resting horizontal position in the cold and postural test. Using this figure also, he has classified patients in three types on the basis of the width of the pulse pressure, as follows:

Type I hypertensives—patients with narrow pulse pressures, which are less than one half the diastolic blood pressure.

Type II hypertensives—patients with wider pulse pressures, equal to or up to 19 mm. more than one half the diastolic blood pressure.

Type III hypertensives—patients with the widest pulse pressures, which are 20 mm. or more greater than one half the diastolic blood pressure.

The graphic chart is also used to determine whether or not the

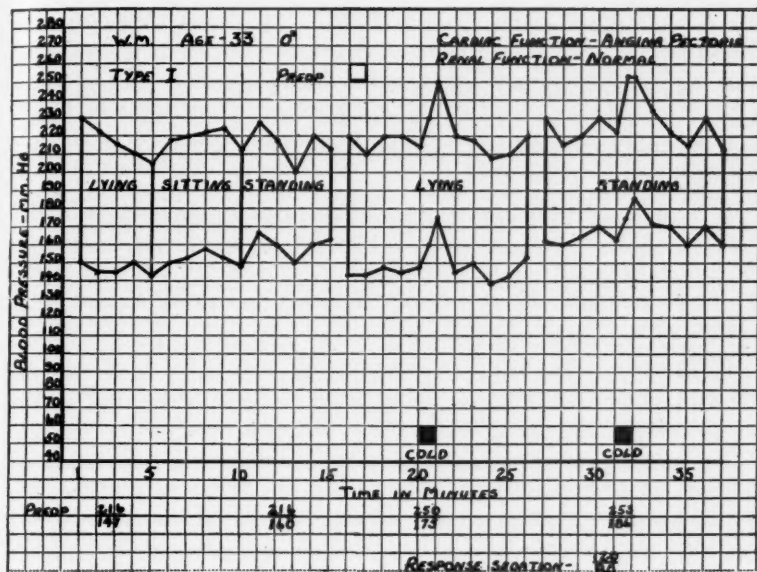


Fig. 1. A typical graphic chart of the preoperative cold and postural blood pressure test in a hypertensive patient showing the responses to changes in position and to stimulation by cold. This patient obtained an excellent result from lumbodorsal splanchnicectomy (see Table I).

patient is a hyperreactor to posture or cold, or both.

According to Smithwick's data,<sup>1</sup> in general, patients with type I hypertension are the most favorable candidates for surgery, patients with type II hypertension are the next in order, and patients with type III hypertension, or the wide-pulse-pressure type, are the least favorable candidates. A patient is more favorable in general if he is a hyperreactor to posture or to cold, or both, as evidenced by the responses on the cold and postural blood pressure test. We consider this test of great importance in evaluating the patient for surgery.

Smithwick has outlined certain contraindications to operation in hypertensive patients.<sup>2</sup> We have followed these in general and have set up the following criteria:

1. No patient over 50 years of age has been operated upon.
2. No patient with uremia or impending uremia was operated upon.
3. No patient with congestive heart failure and impaired renal function, as indicated by an elevated blood urea nitrogen and greatly reduced phenolsulphonphthalein test, was operated upon. Conges-

tive heart failure alone was not considered a contraindication to surgery.

4. Male patients with a resting diastolic level of 140 mm. or more were not operated upon unless the cardiac and renal functions were normal and there had been no history of encephalopathy or of cerebrovascular accident.

5. Patients with hemorrhages, exudates, and papilledema of the eyegrounds were not necessarily excluded from operation on the basis of retinopathy alone provided they did not fall into any of the above groups and the data from the cold and postural test were favorable.

6. Patients with hypertension and pyelonephritis were not excluded from operation because Smithwick<sup>1</sup> has found that these pyelonephritics do exceptionally well following surgery.

Though much emphasis is attached to the blood pressure responses in these patients, they must be considered as a whole, for hypertension is a generalized disease. In general, the criteria for selection were rigidly adhered to, and conservatism in offering the operation was the rule, except for the two cases described in detail below.

#### TECHNIC AND MANAGEMENT

Methods of splanchnicectomy have been described by Craig,<sup>3</sup> Peet,<sup>4</sup> Smithwick,<sup>5</sup> and Grimson.<sup>6</sup> We have employed in all cases Smithwick's technic of lumbodorsal sympathectomy and splanchnicectomy. In the majority of instances ganglia D<sub>8</sub> to L<sub>2</sub>, inclusive, and the great splanchnic nerves were removed bilaterally. In some cases L<sub>2</sub> was purposely not removed at the patient's request because of interference with ejaculation. The operation was performed in two stages usually 10 days apart. Endotracheal-gas-oxygen-ether anesthesia was used. An S-shaped incision was employed, and portions of both the eleventh and twelfth ribs were removed. The sympathetic nerves were then removed extrapleurally and extraperitoneally through a transdiaphragmatic approach. The adrenal gland, kidney, and renal vessels were inspected directly and palpated. Cotton and silk suture materials were employed throughout. Drainage was not used. Penicillin was used routinely for a few days postoperatively to obviate any pulmonary complications resulting from the use of the endotracheal tube.

There was no death in this series. There were 4 complications in 3 patients. In the first patient, on the seventh day after the first operation, secondary hemorrhage occurred in all layers of the



wound, and the entire wound from diaphragm to skin was opened and resutured. A second patient developed an exfoliative dermatitis following penicillin administration after the first operation, and atelectasis not requiring bronchoscopy after the second operation. A third patient at the time of the second operation underwent such a profound drop in blood pressure after administration of anesthesia that completion of the operation was postponed and later carried out without incident. There were no infections and no pleural or extrapleural effusions of any consequence.

Proper postoperative management is a very important, and occasionally life-saving, phase of the operation. Continuous intravenous infusions of 5 per cent dextrose in water were routinely employed for the first 24 to 48 hours, supplemented by whole blood and plasma as necessary to offset the discrepancy between blood volume and the capacity of the vascular bed in the acutely denervated state. Special nurses were necessary, and blood pressure and pulse readings were taken at frequent intervals to obviate the possibility of unsuspected and sudden circulatory failure. The patients were encouraged, however, to be out of bed from the second day onward after the first stage. Ambulation was not quite so rapid after the second stage because the profound postural hypotension which follows bilateral denervation of the legs and splanchnic bed resulted in syncope when the patient assumed the upright position. To counteract this postural hypotension, a tight lower abdominal binder with sponge rubber or felt pads was employed, as well as ace bandages on both lower legs from the instep to the knee. In this way patients were able to be up by the third day after the second stage. This apparatus was worn from 2 to 4 months and then gradually discarded as the blood pressure in the upright position became stabilized with the regaining of intrinsic tone of the smooth muscles of the blood vessels of the legs and splanchnic bed. Convalescence is slow in these patients and requires usually 4 to 6 months or more before entirely normal activities can be resumed.

#### RESULTS OF OPERATION ON BLOOD PRESSURE

Table I shows the results of lumbodorsal splanchnicectomy on the blood pressure of the 15 patients operated upon and followed 4 months to one year. The blood pressure figures represent the average of the first 5 readings taken during the cold and postural test. The same test was performed both preoperatively and postoperatively in a standard, routine fashion, as outlined above, and hence the figures are suitable for comparison.

Of the 15 patients, 11 showed a diastolic fall of 10 mm. of mer-

TABLE I

*Results of Lumbodorsal Splanchnicectomy on the Blood Pressure of 15 Hypertensive Patients\**

| Patient  | Age | Type | Pre-operative     | Post-operative    | Difference       | Time post-op |
|----------|-----|------|-------------------|-------------------|------------------|--------------|
| J. H.    | 31  | I    | $\frac{147}{100}$ | $\frac{136}{106}$ | $\frac{-11}{+6}$ | 12 mos.      |
| D. B.    | 40  | I    | $\frac{153}{115}$ | $\frac{119}{89}$  | $\frac{34}{26}$  | 4 mos.       |
| J. S.    | 37  | I    | $\frac{172}{116}$ | $\frac{143}{89}$  | $\frac{29}{27}$  | 4 mos.       |
| F. K.    | 23  | I    | $\frac{168}{120}$ | $\frac{136}{95}$  | $\frac{32}{25}$  | 11 mos.      |
| W. J.    | 32  | I    | $\frac{165}{123}$ | $\frac{139}{104}$ | $\frac{26}{19}$  | 4 mos.       |
| C. J. P. | 22  | I    | $\frac{179}{127}$ | $\frac{169}{118}$ | $\frac{10}{9}$   | 7 mos.       |
| B. B.    | 29  | I    | $\frac{174}{131}$ | $\frac{201}{163}$ | $\frac{+27}{32}$ | 9 mos.       |
| J. W.    | 24  | I    | $\frac{197}{132}$ | $\frac{180}{113}$ | $\frac{17}{19}$  | 5 mos.       |
| R. P.    | 31  | I    | $\frac{230}{142}$ | $\frac{130}{90}$  | $\frac{100}{52}$ | 6 mos.       |
| W. M.    | 33  | I    | $\frac{216}{147}$ | $\frac{135}{95}$  | $\frac{81}{52}$  | 10 mos.      |
| C. C.    | 34  | II   | $\frac{157}{103}$ | $\frac{120}{80}$  | $\frac{37}{23}$  | 9 mos.       |
| C. P.    | 24  | II   | $\frac{179}{117}$ | $\frac{230}{154}$ | $\frac{+51}{37}$ | 7 mos.       |
| R. F.    | 38  | II   | $\frac{187}{123}$ | $\frac{138}{91}$  | $\frac{49}{32}$  | 8 mos.       |
| G. B.    | 33  | II   | $\frac{189}{125}$ | $\frac{131}{96}$  | $\frac{58}{29}$  | 9 mos.       |
| R. W.    | 43  | III  | $\frac{191}{111}$ | $\frac{151}{94}$  | $\frac{40}{17}$  | 8½ mos.      |

\*The blood pressure figures are all lying levels taken as the average of the first 5 readings (lying) in the cold and postural test.

cury or more, and these are considered worthwhile results. One patient (C. J. P.) exhibited a drop of only 9 mm. diastolic, but that his operation was worthwhile is brought out in the case report below. One patient (J. H.), a negro, had essentially the same blood pressure at the end of one year as he had had preoperatively. From all criteria, he was thought to be an excellent candidate. Two patients (B. B. and C. P.) exhibited higher blood pressures after operation than before. Both were thought to be suitable candidates preoperatively, and no reason can be given for these failures to date. That a complete sympathectomization was carried out in all three of these patients is illustrated by the fact that the abdominal belt and ace bandages were necessary in the postoperative period to

counteract the postural hypotension. One of these 2 latter patients (B. B.) was a negro, also. It is of interest that of the 3 patients in whom the blood pressure was the same or higher postoperatively, 2 were colored patients, the only 2 colored patients in the series. Whether this racial difference is of any significance, however, cannot be stated from only 2 cases.

#### RESULTS OF OPERATION ON ENCEPHALOPATHY

Two patients with severe, rapidly progressing malignant hypertension with encephalopathy were studied and operated upon. The symptomatic relief obtained from splanchnicectomy was so dramatic that they are reported in some detail. Though the lowering in blood pressure *per se* has not been too striking in these 2 patients, the results from operation are considered thoroughly worthwhile because of the marked general improvement following operation.

#### CASE REPORTS

CASE 1. J. W., a 24 year old Army nurse had a blood pressure of 130/84 recorded in an Army installation in December, 1944. In March, 1945, she embarked for the China-Burma-India theater and was seasick throughout the voyage of 35 days. Her vision became blurred while on the trip. On arrival in India she was hospitalized and found to have a blood pressure of 195/135, facial and periorbital puffiness, albuminuria, hemorrhages, exudates, and papilledema of the eyegrounds. She also had polyuria, lack of urine-concentrating power, and some hematuria. She began to vomit and complain of headaches and then exhibited the full-blown picture of cerebral edema. She was treated vigorously but continued to have repeated attacks of encephalopathy, including generalized convulsions and transient mental disorganization.

She recovered sufficiently, however, to be evacuated to the United States, arriving at a General Hospital on 5 Aug. 1945, where she was studied. Her blood pressure ranged from 210 to 180 systolic and 150 to 130 diastolic, with an average lying level of 197/132 on the cold and postural test. The electrocardiogram showed sinus tachycardia, right axis deviation, and ventricular extra systoles. Urine specific gravity was 1.015. The urine showed occasional white cells and red cells and 2 plus albumin. The intravenous phenolsulphonphthalein test showed excretion of 15 per cent at 15 minutes, 15 per cent at 30 minutes, 12 per cent at one hour, and 10 per cent at 2 hours, a total of 52 per cent. Intravenous pyelogram was within normal limits. Her eyegrounds showed hemorrhages, exudates, and blurring of the discs. She was bedridden and weighed only 96 pounds, having lost 30 pounds. She complained of constant headache which required morphine for relief to the extent that she had become an addict.

The patient had a bilateral lumbodorsal splanchnicectomy performed in 2 stages. Following operation she was out of bed in a week and her symptoms completely disappeared. At the end of 5 months she continued symptom-free, had regained her normal weight, had a normal electrocardiogram, an improved phenolsulphonphthalein test, and had regression of the eyeground

changes so that only mild optic atrophy was present. Her blood pressure was 180/113, a fall of 17/19 mm.

Though this patient's blood pressure was still elevated when last checked, it had been significantly reduced, her symptoms had been relieved, and her eyes, electrocardiogram, and renal function were improved. Of significance is the fact that the renal biopsy taken at operation showed healed pyelonephritis and only grade 1 vascular nephritis. Smithwick<sup>1</sup> reports that hypertensive patients with pyelonephritis respond particularly well to splanchnicectomy.

CASE 2. C. J. P., a 22 year old male, was in an Army hospital because of osteomyelitis of the left tibia following a battle injury. Blood pressure readings in September, 1945, at the time of 2 operations on the left leg, were normal. In November, while on furlough, his appendix was removed at a civilian hospital, and his blood pressure was 154/106. Shortly thereafter the patient developed catarrhal jaundice, but this improved somewhat and he was able to return to the Army hospital. He was studied and treated on the medical service for the hepatitis. The patient then began to complain of headaches and difficulty in vision. His blood pressure was found to be 190/140. The electrocardiogram was compatible with myocardial damage and left axis deviation. Intravenous pyelogram was within normal limits. NPN was 24. The urine showed 3 plus albumin, occasional granular casts, and a few red cells. The urine concentrated to 1.020. Intravenous phenolsulphonphthalein test showed excretion of 20 per cent at 15 minutes, 12 per cent at 30 minutes, 12 per cent at one hour, and 5 per cent at 2 hours, a total of 49 per cent. Examination of the eyegrounds showed hemorrhages, exudates, and papilledema. The average lying blood pressure on the cold and postural test was 197/127.

It was decided to operate on this patient, but he suddenly exhibited the picture of encephalopathy with nausea, vomiting, convulsions, constant headaches, and complete loss of vision with increasing papilledema and retinitis. The blood pressure reached 190 diastolic. He was given large doses of sedatives and intravenous fluids were administered with improvement. Bilateral lumbodorsal splanchnicectomy in 2 stages was completed on 11 March 1946. Convalescence was uneventful. The headaches disappeared and at the end of a month he was able to be up, was gaining weight, had had no recurrence of his jaundice, and his vision had improved. At 2½ months postoperatively he was able to see enough to go on furlough alone. At the end of 7 months his average lying blood pressure was 169/118, a fall of 10/9 as compared with the preoperative level before the onset of encephalopathy. The eyegrounds showed only mild optic atrophy, he was able to read, and had gained 40 pounds in weight. When last heard from at the end of 11 months he was still symptom-free, had had continued improvement in vision, and felt well.

Though this patient's pressure was still elevated when last checked, it had been reduced. In spite of some irreversible damage to the optic fundi, his vision rapidly improved, as did his general health. Symptoms were completely relieved. The hepatitis was a cause of great concern after both operations because of the necessity of using ether as the anesthetic agent. Fortunately no complication occurred. The prognosis in this patient must still be regarded

as questionable because of the extremely rapid course which his disease pursued. Without a doubt, however, his life span has been prolonged for an unknown period of time, and the operation has therefore been thoroughly worthwhile.

#### RESULTS OF OPERATION ON EYEGROUNDS, ELECTROCARDIOGRAMS, RENAL FUNCTIONS, AND SYMPTOMS

Eleven patients showed abnormal eyegrounds preoperatively. Postoperatively, 7 showed improvement, 3 were the same, and one patient was worse. Three patients with papilledema were all improved. In general, the worse the eyegrounds the greater the improvement following operation.

Seven patients showed electrocardiographic abnormalities of various sorts. Four were improved, 2 were the same, and none was worse following operation.

One patient had a preoperative elevation of non-protein nitrogen. Eleven months postoperatively this was the same, but the patient had no symptoms and had a lowered blood pressure. This patient's phenolsulphonphthalein test was abnormal preoperatively and remained the same postoperatively. Another patient had slight impairment of the phenolsulphonphthalein test, and this improved postoperatively. Six patients showed preoperative albuminuria. Postoperatively only one exhibited albumin, and this was improved over the preoperative findings.

One patient (G. B.) is of interest in that on the preoperative routine intravenous pyelogram, a non-functioning right kidney was discovered. The preoperative average lying blood pressure was 189/125 and the standing level 195/143. The right kidney, a pyonephrotic one, was removed. Three months following nephrectomy the average lying blood pressure 157/108, and the average standing was 173/128. The patient was then subjected to bilateral lumbo-dorsal splanchnicectomy. Nine months after this operation the average lying blood pressure was 131/96 and the average standing was 119/89.

Seven patients showed abnormal urine sediments preoperatively. Five of these showed normal or improved sediment postoperatively, 2 were the same, and none was worse.

Twelve patients complained of varying symptoms, such as headache, chest pain, dizziness, etc. Postoperatively, 10 were completely relieved of symptoms, and 2 were improved. None was worse.

## PHYSIOLOGY, OTHER THAN BLOOD PRESSURE LOWERING

In addition to the profound postural hypotension occurring in the acutely denervated stage in these patients, which has been described in another paragraph, there are certain other physiologic effects of operation which bear mentioning.

*Sterility.* In the male patient undergoing lumbodorsal splanchnicectomy, the problem of sterility following operation arises. In general, when the ganglia  $D_8$  through  $L_2$  inclusive, and the splanchnic nerves are removed bilaterally, the patient loses the power of ejaculation and is therefore sterile but is not rendered impotent. When ganglia  $D_8$  through  $L_1$  inclusive, and the splanchnic nerves are removed bilaterally, the patient does not as a rule lose the power of ejaculation and is not rendered impotent. If ganglia  $D_8$  through  $L_2$  and the splanchnic nerves are removed on one side, and ganglia  $D_8$  through  $L_1$  and the splanchnic nerves are removed on the other, about half the patients lose the power to ejaculate, and the rest remain normal. Potency is not affected. This entire problem must be discussed with the patient prior to operation.

Sexual function in the female is not affected by lumbodorsal splanchnicectomy. Visceral pain from the pelvic organs is no longer felt, however, because of the interruption of afferent pathways.

*Nausea and cramps.* Some patients complain of abdominal cramps, gas, and nausea in varying degrees of severity. Occasionally a patient has diarrhea following bilateral section. Auscultation of the abdomen reveals hyperactive peristalsis. Tincture of belladonna and mineral oil are useful in the management of these symptoms, which may persist for some weeks postoperatively but eventually completely disappear. They are most likely a manifestation of autonomic imbalance in the acutely denervated state.

*Extent of sympathetic denervation.* In the usual operation, sympathetic ganglia and intervening chain from  $D_8$  to  $L_2$  inclusive, all communicating visceral rami, and the greater splanchnic nerves from the midthoracic region to the semilunar ganglion are removed bilaterally. This results in a postganglionic sympathetic denervation of the trunk from the costal margins to the groin, a preganglionic denervation of the splanchnic bed, and a preganglionic denervation of the skin of the lower extremities. One can determine the exact outline of the denervated area by the simple but accurate method of electrical skin resistance as described by Richter and his associates.<sup>7</sup> The trunk and lower extremities are warm and dry following operation though the anterior surface of the thighs continues to sweat somewhat. The rest of the body, particularly the arms, compensates by increased sudomotor and vasomotor activity.



*Blood pressure hyperreactivity.* Following the drop in blood pressure which accompanies anesthesia, on the fourth to seventh day after the second operation the blood pressure in the majority of these patients begins to rise and in 24 to 48 hours reaches or even goes above the preoperative blood pressure levels. This hypertension persists for several days, and then the blood pressure settles down to lower levels. The curious phenomena noted in the early weeks after sympathectomy of the extremities for peripheral vascular diseases have been discussed by Smithwick.<sup>8</sup> These blood pressure changes are probably a manifestation of similar physiologic processes.

#### SUMMARY

1. A series of 15 patients with arterial hypertension treated by lumbodorsal splanchnicectomy and followed from 4 months to one year is presented.
2. Twelve patients had significant drops in blood pressure and are considered worthwhile results. Three patients had the same or higher blood pressure following operation.
3. Two cases of malignant hypertension and encephalopathy with marked improvement after operation are reported.
4. The majority of the patients showed improvement or return to normal of renal function, eyegrounds, electrocardiograms, and symptoms.
5. A brief outline of the method of study, indications for operation, technic of operation, and physiology is given.

#### REFERENCES

1. Smithwick, R. H.: Surgical Treatment of Hypertension: Effect of Radical (Lumbodorsal) Splanchnicectomy on Hypertensive State of 156 Patients followed 1 to 5 Years, *Arch. Surg.* 49:180, 1944.
2. Smithwick, R. H.: Surgical Treatment of Hypertension, *New York State J. Med.* 44:2693, 1944.
3. Craig, W. M.: Surgical Approach to and Resection of the Splanchnic Nerves for Relief of Hypertension and Abdominal Pain, *West. J. Surg.* 42:146, 1934.
4. Peet, M. M.: Splanchnic Section for Hypertension: A Preliminary Report, *Univ. Hosp. Bull., Ann Arbor* 1:17, 1935.
5. Smithwick, R. H.: A Technique for Splanchnic Resection for Hypertension; Preliminary Report, *Surgery* 7:1-8, 1940.
6. Grimson, K. S.: Total Thoracic and Partial to Total Lumbar Sympathectomy and Celiac Ganglionectomy in Treatment of Hypertension, *Ann. Surg.* 114:753-775, 1941.
7. Richter, C. P., and Whelan, F. G.: Electrical Skin Resistance Technic, Used to Map Areas of Skin Affected by Sympathectomy and by other Surgical or Functional Factors, *Arch. Neurol. & Psychiat.* 40:454-456 (March) 1943.
8. Smithwick, R. H.: Surgical Intervention on the Sympathetic Nervous System for Peripheral Vascular Disease, *Arch. Surg.* 40:286-306, 1940.

## THE TREATMENT OF ANURIA BY PERITONEAL IRRIGATION

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SEVERAL methods based on the principle of the perfusion of fluids through a dialyzing membrane have been devised for the treatment of acute renal failure. They have been used in an attempt to carry the load of the kidney at least partially through the transitory anuric state. In 1932 Bliss et al<sup>1</sup> reported a method of reducing the urea nitrogen by gastric lavage with large quantities of fluid. In 1944 Rhodes and Saltonstall,<sup>2</sup> following the method of Rountree, Able and Turner, used long sausage-casing lined tubes bathed in Ringer's solution with a concentration of gelatin sufficient to counteract the osmotic pressure of the blood plasma. Their patients were first heparinized and the blood from the arterial side of the patient went into the inlet side and was directed back into the venous circulation. They were able to reduce the urea nitrogen by this method. The perfusion of an isolated loop of small bowel with Tyrodes solution was tried by Fine et al,<sup>3</sup> but they found that the most successful method was by irrigating the peritoneal cavity with the solution.

Putman<sup>4</sup> in 1923 showed that the peritoneum was an excellent dialyzing membrane and was readily permeable to water and crystalloids. Peritoneal irrigation utilizes this finding in removing diffusible substances from the blood stream and eventually from the extra-cellular fluid. Seligman, Fine, and Frank<sup>5</sup> showed experimentally in dogs that adequately conducted peritoneal irrigation would provide 40 to 75 per cent of normal kidney function in terms of urea clearance, correct acidosis, and prevent death from uremia following bilateral nephrectomy. This same group has subsequently made two clinical reports that in terms of results add a method of treatment of transitory anuria that is simple, easily accomplished, and in selected cases offers more chance for a successful outcome than any method heretofore devised. This is not to say that the more conservative methods of treatment such as the conventional intravenous glucose, caffeine, etc., are outmoded but that another weapon has been placed at our disposal that merits consideration when the common methods fail. It is founded on basic physiologic principles and does not require an elaborate set-up.

In this clinic peritoneal irrigation has been tried on two occasions. The first case is not reported here but was that of a 74 year old colored female admitted to the hospital in uremic coma; peritoneal

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Clinic of Gamble Brothers & Archer, Greenville, Miss.

irrigation was tried as a last resort after she had had concentrated glucose and two spinal anesthetics in an attempt to produce diuresis. She expired 72 hours after admission and necropsy showed small contracted kidneys with marked nephrosclerosis. From our limited experience here and from reports in the literature it would seem that the only chance for success would be in those patients who, prior to the development of the anuric state, had a normal kidney function.

The simplest possible apparatus for the irrigation was used. The abdomen was prepared with soap and water, painted with merthiolate and draped. An area in the right lower quadrant and another in the left lower quadrant was anesthetized with 1 per cent novocain. The right side was chosen for the inlet side and after a small stab a trochar was inserted into the peritoneal cavity through which a No. 18 French catheter was inserted and the trochar withdrawn leaving a tight inlet tube. On the left side as an outlet a regular sump surgical suction was inserted into the cul-de-sac through a very small incision. The inlet was connected to a regular glucose drip and the outlet to a Wangenstein suction apparatus. The fluid was run in at a rate of 60 c.c. per minute and at no time during the 6 days of its use was there any problem of stoppage. There was some leakage at first at the outlet. Dressings were used to support the tubes and were changed every 24 hours. It might be said here that it is felt in the future fluid should be run through just as fast as possible in the hope that more urea nitrogen may be washed out, since it is felt that the volume of fluid washed through the peritoneal cavity is the important factor. The Tyrodes solution was made up fresh every 24 hours from the two solutions used and heparin and penicillin added.

#### REPORT OF CASE

Mr. J. M. entered the hospital April 29, 1947, complaining of indigestion, weakness and bloody vomitus, the latter symptom of 12 hours' duration. In 1938 he had been treated here for a ruptured duodenal ulcer and had had a rather stormy time of it. He developed a sub-diaphragmatic abscess which was drained and was hospitalized for 59 days. It is interesting to note that at that time he had had a suppression of urine for 24 hours in the immediate postoperative state that was not connected with a blood transfusion and responded to conventional treatment.

Since operation in 1938 he had been bothered with indigestion and some preprandial pain, but he had not been on an ulcer diet nor had he taken any alkali regularly. Twenty-four hours prior to admission he began to have bloody vomitus and sought medical care.

Upon admission he was in good condition. There was no shock and blood pressure was 128/90. There was considerable thickening of the radial vessels and pulse was full and regular with no evidence of cardiac pathology. Physical

examination was negative save for some tenderness over the epigastrium and an incisional hernia in the old right rectus scar.

Laboratory: Red blood cells 3,700,000, hemoglobin 11.5 gm., with a normal differential. Wassermann was negative. The urine was clear, yellow, specific gravity 1.024, negative sugar, negative albumin and no casts or blood cells.

He was given parenteral glucose and started on a negative suction. Twenty four hours after admission there was no blood in the suction bottle and he was given 500 c.c. of compatible blood without reaction. He was a type O Rh positive. He was also given vitamin K hypodermically.

Four days after admission he was started on milk and jello every 3 hours, which he tolerated well. On the fifth day following admission a barium meal was given which showed a duodenal ulcer, with retention of the meal at the end of 6 hours. His red blood count was 4,200,000, with 13 Gm. of hemoglobin; urea nitrogen 15.18 mg. per cent and blood sugar 87. Donors were typed in preparation for surgery.

On the ninth day after admission under pentothal anesthesia with curare, a subtotal gastric resection was done. The procedure required 4 hours but he withstood it well. He was given 1000 c.c. of blood during the procedure. Pathologic diagnosis of the specimen was bleeding duodenal ulcer.

Shortly after returning from surgery his temperature rose to 104. In the first 24 hours postoperatively he passed but 60 c.c. of urine, which appeared dark red. The urea nitrogen was 56 mg. per cent. A caudal block with 1 per cent novocain was done and he was started on continuous 10 per cent glucose in distilled water and given  $7\frac{1}{2}$  grains of caffeine sodium benzoate every 6 hours.

On the second postoperative day he passed but 70 c.c. of urine, which was still reddish black and the urea nitrogen was 52 mg. per cent. There was no edema and his general condition seemed good. He was clear mentally and cooperative. Another caudal block was done and he was given 50 c.c. of 50 per cent glucose intravenously in addition to the continuous 10 per cent glucose.

On the evening of the third postoperative day he had still shown no inclination to pass urine and was a little dull mentally. It was decided to institute peritoneal irrigation in the hope that he could be tided over.

The first 24 hours following institution of the peritoneal irrigation he passed but 30 c.c. of urine. The irrigated fluid showed 55 mg. per cent of urea nitrogen and the blood urea had dropped to 44 mg. per cent.

The second day of the procedure he passed 330 c.c. of urine and seemed improved. His urea nitrogen was 44.4 mg. per cent, hematocrit 22 and chlorides 495. He was given 500 c.c. of type and Rh compatible blood and had a severe reaction with a chill.

The third day he passed 570 c.c. of urine. He was quite restless and began to develop edema of the feet and ankles and required restraint and sedatives for restlessness.

On the fourth day he passed 440 c.c. of urine but his condition was deteriorating and blood urea had risen to 81.2 and creatinin 12.6. He lost ground quite rapidly, with a rising urea nitrogen and creatinin and secreted less and less urine, with progress of the edema, and expired on the ninth postoperative day and the sixth day following the institution of the irrigation. The irrigated fluid showed a rise in urea nitrogen content as the blood urea rose. However,

this is a variable factor and, as stated before, it is felt that more urea may be removed with more fluid irrigated through the peritoneum and, as suggested by Fine et al,<sup>3</sup> the edema controlled better by increasing the concentration of glucose in the solution.

#### DISCUSSION

Thus far the results of the use of peritoneal irrigation have not been too encouraging although it has definitely shown that nitrogenous wastes can be removed from the blood. In this case there had been a previous episode of urinary suppression and while a post mortem was not granted it is a good probability that there was a low kidney reserve with renal pathology. It would seem that this method of treating anuria will find its greatest application in those cases where the kidney prior to the anuric state was normal. Certainly this would have given us something to work on with the anuria seen during the war that followed severe shock and occurred in previously healthy young males.

#### REFERENCES

1. Bliss, S.; Kastler, A. O., and Nadler, S. B.: Peritoneal Lavage. Effective Elimination of Nitrogenous Wastes in Absence of Kidney Function, *Proc. Soc. Exper. Biol. & Med.* 29:1078-1079, 1932.
2. Rhoads, J. E.: Peritoneal Irrigation in Uremia, Discussion, *Ann. Surg.* 124:877 (Nov.) 1946.
3. Fine, J.; Frank, H. A., and Seligman, A. M.: Treatment of Acute Renal Failure by Peritoneal Irrigation, *Ann. Surg.* 124:857-878 (Nov.) 1946.
4. Putnam, T. J.: Living Peritoneum as a Dialyzing Membrane, *Am. J. Physiol.* 63:548-565, 1923.
5. Seligman, A. M.; Frank, H. A., and Fine, J.: Treatment of Experimental Uremia by Means of Peritoneal Irrigation, *J. Clin. Invest.* 25:211-219 (March) 1946.

## THE MASQUERADING HYPERTHYROID PATIENT

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### INTRODUCTION

THE usual patient with primary hyperthyroidism presents no problem in establishing a diagnosis. Often he gives some important diagnostic clues by his appearance, mannerisms and behavior while sitting in the office waiting room. The nervous woman with prominent eyes, flushed skin and trembling hands, or the alert, thin, restless man who bites his nails and chain smokes cigarettes, usually suggests to the examiner the likelihood of hyperthyroidism. Classically, primary hyperthyroidism is characterized by enlargement of the thyroid gland, tachycardia, tremor, exophthalmos and increased activity of the vegetative nervous system. This picture was the one commonly seen years ago before the introduction by Plummer of iodine in the treatment of goiter. Today this classical picture is uncommonly presented. Many of the cardinal features of the disease are not apparent, and some of these patients are branded as neurotics and deprived of proper treatment. This is particularly true of the borderline cases who have "shopped around" from one physician to another and who have had very little time devoted to them in evaluating their long, often drawn out, history. The average physician has more work to do than he can adequately care for, and this has been especially true during the recent war with so many of the younger men in military service. Especially does this apply to the general practitioner whose job it has been to see these patients first. With the extra burden of work on him, the long hours on house calls, and the shortage of skilled help, is it any wonder that some of these patients have not had a careful and detailed history taken?

In borderline cases of primary hyperthyroidism every effort must be made to allow the patient to tell her own story. This, of course, takes time and will require listening to many irrelevant details but usually the clue to the solution of her problem can be obtained. Leading questions may be asked but they should not interfere with the story of the illness as narrated by the patient. If allowed to unfold the history without too many interruptions, the patient feels more at ease and does not have the feeling of being cross-examined. She must not get the impression that the physician is rushed, is hur-



rying to see the next patient or is impatient with her as she unravels the details of her story. During the time that she is allowed to tell her story, the physician has ample opportunity to observe and study her. Frequent shifting about in the chair, crossing and uncrossing the knees, biting the fingernails, tapping the fingers on the table, sighing respirations, breathlessness and air hunger, are some observations that often can be made. A physician will have to be tactful in determining when and how to interrupt a long, drawn out story but in the majority of cases this can be accomplished without the patient's realizing it. The occasional patient has seen the psychiatrist<sup>4</sup> because of irritability to the extent of being intolerable. Crying spells, fits of anger and bouts of depression will occasionally be uncovered. Sometimes the patient consults her physician because of an irritable colon, episodes of diarrhea, flatulence, and dyspepsia. Weight loss has been treated with high caloric diets, vitamins and tonics, in many instances too long before the diagnosis becomes apparent. Some patients with secondary anemias with weakness in the legs have been treated with iron and liver.

#### BASAL METABOLISM AND OTHER LABORATORY PROCEDURES

All patients with hypermetabolism are not hyperthyroid. Often the elevated metabolic determination is due to some technical error. The metabolism should be determined only after a good rest, without medication, and after the patient has been advised regarding the manner of carrying out the test and the technic explained to her. Often, repeated determinations are necessary before an accurate decision can be made. Certainly, Lugol's solution should not be started until a satisfactory and accurate determination has been carried out. Fevers, pregnancy, hypertension, pernicious anemia, leukemias, and acromegaly produce elevated metabolism.<sup>1</sup> Excessively high metabolic rates, however, almost invariably are due to hyperthyroidism.<sup>3</sup> As with other laboratory tests, the evidence presented is purely contributory and should not be the sole guide which dictates the type of treatment carried out.

As a rule the blood cholesterol is decreased and the change in this determination has been used as a guide to the progress of the disease.<sup>2</sup> This determination is often within normal limits, however, in minor grades of toxicity. Dailey<sup>1</sup> is of the opinion that it should not be relied on too strongly as a diagnostic aid. The blood cholesterol determination is a difficult technical procedure and cannot be performed reliably by the average laboratory technician.

Often the blood picture shows a lymphocytosis but this is not diagnostic. The urine occasionally shows a trace of sugar, but

diabetes can be ruled out by blood sugar determinations and the glucose tolerance curve. However, the glucose tolerance curve is often elevated in hyperthyroidism, suggesting mild or borderline diabetes mellitus. Other more sensitive and less dependable tests such as the blood iodine (Hurxthal), galactose tolerance (Aethausen), creatine-creatinine ratios, and the sensitivity to epinephrine (Goetsch) are used in some cases. By and large, though, a diagnosis of hyperthyroidism can be made in almost all cases without using these less uniformly accepted laboratory procedures.

#### SIGNIFICANT DIAGNOSTIC FEATURES

1. *Weight loss.* Most of these patients will give a history of weight loss. This, along with an increased appetite, is very significant. Pulmonary tuberculosis, blood dyscrasias, and malignancies of the intestinal tract must be ruled out with appropriate diagnostic studies. In the absence of forced feeding and the use of Lugol's solution any gain in weight in these cases is quite exceptional.

2. *Heat intolerance.* Many of these borderline hyperthyroid patients will not volunteer this information but further questioning will reveal their dislike for hot weather. Often they do not wear a topcoat during winter, and they require less cover than their bed-mate.

3. *Muscular weakness.* This is a fairly early sign in most cases and usually manifests itself in the calves of the legs. Almost invariably these patients will complain of difficulty in climbing stairs.

4. *Goiter.* While the majority of cases of primary hyperthyroidism have an enlargement of the thyroid gland, many patients are seen where it is difficult to demonstrate any increase in its size. As a rule, careful examination of the neck will reveal some increase in the size but we often see cases that are hyperthyroid where no goiter can be demonstrated.

5. *Therapeutic test.* In these borderline cases and after all necessary diagnostic study has been carried out, the administration of iodine in the form of Lugol's solution may be used. If the patient is hyperthyroid, there will almost invariably be an amelioration of the symptoms, a slowing of the pulse, a decrease in metabolism, and a gain in weight. This improvement is usually noted within a period of 7 to 10 days. All patients should be impressed with the fact that Lugol's solution is only a preparatory treatment for surgical resection, and it cannot be used indefinitely. Frequently the improvement is so marked that it is difficult for the patient to understand why an operation is necessary.

## CASE REPORTS

CASE 1. Mrs. W. S., aged 41, presented herself for examination and treatment of weakness, nervousness, and abdominal distress after meals. She complained of much gas in the upper abdomen, and distress after eating. She said that she had indigestion after eating any type of food and that induced vomiting was the only thing that gave her relief. She was nervous during her menses, had palpitation, and hot flashes. Menstrual periods were not prolonged and were regular. She often had bouts of diarrhea with much gas, but no blood in the stools.

Examination revealed a well developed, well nourished woman who did not appear agitated. The thyroid was slightly enlarged, but with a diffuse enlargement. Blood pressure 122/80; pulse 92; remainder of physical examination was normal. Examination of the gallbladder, G.I. series, and barium enema revealed no pathology. She was reassured, placed on mild sedatives and told to return in 2 weeks.

At the end of 30 days she was not improved and had lost a few pounds in weight. She was more nervous, had developed a fine tremor, and was eating frequent small feedings daily. Her symptoms were still thought to be due to an early menopause with functional indigestion. A basal metabolism rate was plus 44 per cent. After preparation with Lugol's solution the thyroid was resected without incident. The convalescence was smooth and she has now returned to her job doing clerical work. The pathologist reported hyperplastic thyroid with involution. There were focal areas of lymphocytic infiltration throughout the gland.

*Comment:* In this case attention was first attracted by the abdominal symptoms. It was only after observation over a period of time that a correct diagnosis was arrived at. She was observed for approximately 6 weeks before we were positive that she was hyperthyroid. During this time she had lost 12 pounds in weight, and her abdominal symptoms were alleviated. She has had no return of symptoms since her thyroidectomy.

CASE 2. Mr. R. G. M., aged 51. In December, 1945, he had medical care elsewhere because of a history of a 15 pound weight loss in 3 months, extreme nervousness, palpitation, loss of strength, nocturia, dyspnea on exertion, and an empty feeling in the epigastrium occurring after meals. He stated that he could not be still, felt "jumpy" and was very impatient. There was no history of any increase in his appetite at that time. The review of systems was entirely negative. The past history was negative for any organic diseases of consequence. He was treated for 9 months with a diagnosis of hyperinsulinism and during that time continued to lose weight. At the end of that time he was again studied thoroughly and a diagnosis of hyperthyroidism was made. The basal metabolism was elevated. He was placed on Lugol's solution and within 10 days' time stated that he "felt like a new man." He had gained 5 pounds in weight, the pulse rate had decreased, and he felt much calmer. At no time was there any increase in the size of his thyroid gland. Three weeks later a bilateral resection was carried out and he made an uneventful recovery. Following the operation he regained weight and returned to work. The pathologist reported hyperplastic thyroid with involution.

*Comment:* Because of his increased appetite and hunger sensations requiring the ingestion of large amounts of food, he was originally thought to be suffering from hyperinsulinism.

CASE 3. Mr. D. H., aged 53, was first seen on Oct. 16, 1946, because of extreme nervousness for the past few months and weight loss. He had weighed 210 pounds some 3 or 4 months before, and at the time of examination his weight was 180 pounds. He stated he had a very good appetite and felt that he was eating enough to maintain his weight although it had been usual for him to lose some weight during the summer months. He had been extremely nervous, irritable, easily upset, emotionally unstable, had been gradually getting weak and now reached the point where any amount of exertion caused him to become dyspneic and exhibit palpitation and tachycardia. He stated that he felt "trembly all over" after any exertion. He had always been a very active individual. He had played varsity football at the University of Alabama while a student there and had always been physically active since that time. He had suffered no illnesses until 3 or 4 months previously. Weakness in the legs, particularly in the calf muscles, was marked.

Physical examination revealed a well developed, well nourished white male who did not appear to be acutely ill. No evidence of any enlargement of the thyroid could be detected. Basal metabolic rate was reported as plus 17 per cent. No organic cause for the patient's complaints could be demonstrated.

The patient was reassured, given mild sedative and told to return if the symptoms persisted. About a month later the patient was seen again, stating that he was still weak and "trembly," especially after exertion. No unusual exertion was required for him to experience his feeling of weakness, breathlessness and weakness in his legs. His appetite had remained good. He slept for about 8 hours each night except for getting up to urinate. Pulse rate remained around 100 per minute and there was no difference in his condition since his previous examination. At this time an electrocardiogram was normal except for a slight notching of the T-waves. This finding is an indefinite one and may or may not be significant. It is sometimes seen in unexplained toxic states and occasionally in cases of hyperthyroidism. In view of the tachycardia, the breathlessness on exertion, the trembling feeling after exertion, weight loss and weakness in the calves of the legs, it was decided to give the patient a therapeutic test of Lugol's solution. He was placed on Lugol's solution, 15 min. t.i.d., and instructed to return in one week for a check-up. The patient returned 11 days later and stated that he definitely felt better. He was given, at that time, phenobarbital, gr.  $\frac{1}{2}$  t.i.d., and instructed to continue the Lugol's solution, 15 min. t.i.d., and to return in about a week for another check-up. The patient returned 33 days later and stated he had been feeling fine. He had gained 10 pounds in weight since taking Lugol's solution. He was definitely improved. Thyroidectomy was advised but the patient stated it was impossible for him to have the procedure done at this time because he had just accepted a new and responsible position and could not afford to absent himself from his work. He was then placed on propyl thiouracil, .2 Gm. t.i.d., to be continued until he can undergo surgery.

*Comment:* Even though there is no evidence of enlargement of the thyroid gland, we believe a diagnosis of hyperthyroidism is justified. This is further substantiated in view of his dramatic response to Lugol's solution and propyl thiouracil.

## SUMMARY AND CONCLUSIONS

1. Borderline and atypical hyperthyroidism often require careful study and prolonged observation before a correct diagnosis can be made.
2. The significant diagnostic aids have been enumerated and discussed.
3. Three illustrative cases have been reported.

## REFERENCES

1. Dailey, U. G.: Diagnosis of Thyrotoxicosis, *J. Internat. Coll. Surgeons*, 9:466-474 (July-Aug.) 1946.
2. Christian-Osler: Principles and Practice of Medicine, 15th Edition, D. Appleton-Century Co., Inc.
3. Hinton, J. W.: Danger of Confusing Hypermetabolism with Hyperthyroidism, *Clinical Medicine*, 53:121 (May) 1946.
4. Ficarra, B. J.: Psychosomatic Symptoms and Borderline Hyperthyroidism, *Am. J. Surg.* 71:363-364 (March) 1946.

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## CONTROVERSIAL PROBLEMS IN THE SURGICAL TREATMENT OF CANCER OF THE RECTUM

The surgical treatment of cancer of the rectum remains controversial. Rarely is there a surgical meeting that this subject is not discussed. The advocates of their respective operative procedures are capable, competent surgeons, and sincere in their beliefs.

The abdomino-perineal procedure seemed for a long time to be the accepted answer to the problem. With the advent of primary anastomosis for lesions of the left colon and the success attained, lesions low in the sigmoid that were not accessible for an obstructive resection of the Mickulicz type were treated by resection and primary end-to-end anastomosis. With knowledge gained of the anatomy of the rectosigmoid and rectum from abdomino-perineal resection and the success with primary anastomosis of the colon above the pelvic peritoneum, further attempts were made to unite primarily the bowel after resection of lesions at, or just below, the pelvic peritoneum. It was noted that ligation of the superior hemorrhoidal artery did not devitalize the vascular supply of the distal bowel segment. This essential vascular observation prompted still further primary anastomosis for lesions in this location, and the results in limited malignancy have been justified, perhaps. We have



not refrained from such anastomosis in lesions that were movable and without glandular extension and were located at, or just below, the pelvic peritoneum. However, when fixation and glandular involvement is present, such a procedure is inadvisable and unwise, unless as a palliative procedure in older individuals with short life expectancy.

Much research is available to prove lateral extension of malignancy by lymphatic channels, and often by retrograde involvement. With large fixed lesions and obvious proximal glandular invasion, lateral extension, and even distal involvement may exist. With increasing success in these low sigmoid lesions, the procedure was extended to include pathology to within a few centimeters of the rectal sphincter, or even to the rectal outlet itself, by a method called "the pull through" operation.

So today, this is the controversy. Is it worth while to attempt anastomosis in these extremely low lesions, or to excise completely the rectum and attempt to reconstruct a rectal sphincter of sufficient competency to be serviceable? To say nothing of the obvious inadequacy of the surgical procedure from the standpoint of removing all gland-bearing tissue, the procedure has morbidity and disabling probabilities, such as abscess, sinus formation or incompetent fecal control. All too often, these "pull through" operations result in nothing better than a perineal colostomy, and it would be hard to imagine anything more distasteful or troublesome.

The most that can be said for these low anastomoses is that they maintain the normal fecal current and obviate an abdominal colostomy. This is, without question, at the expense of complete and adequate surgery of the surrounding gland-bearing tissue. All too frequently, local recurrence, or distal metastasis, occurs that might have been prevented with more radical removal. It is essentially an operation for the most experienced surgeon, and it is he who should pioneer this field until such a time has elapsed that sufficient statistical data are available for critical evaluation.

In general, a limitation as to location and extent of the lesion should be thoughtfully considered, and these extremely low-lying lesions should be removed by the old and tried method of abdominoperineal resection. This has been standardized, and is satisfactorily performed by any well-trained and experienced surgeon. The mortality is not great, and the results in operable lesions are good, but could be greatly improved by earlier diagnosis and operation. This is a problem of lay education and medical thoroughness in physical examination. This procedure offers the best chance of cancer eradication, as it removes the widest possible area of cancer-

bearing tissue, and has as its only objection an abdominal colostomy. Its criticism is based solely upon sentiment, unfounded conceptions of a colostomy, and estheticism.

None of these objections are valid. Cancer of the rectum is no respecter of sentiment, and the principle of cancer surgery, here, as elsewhere, should surmount these emotional reactions. It has, as its prime purpose, removal of all the obvious cancer, and all the gland-bearing structure available and possible. Eradication, at an anatomic expense, is essential, if the percentage of cures is to be increased. No compromise is made in treating cancer elsewhere in the colon, in the stomach, or in the breast.

Why, then, for esthetic reasons, compromise in treating cancer of the rectum? A frank presentation of the facts, and discussion with the patient, should in an intelligent individual make it possible to do the operation which offers the best chance of permanent cure, even though it does require an abdominal colostomy, a procedure much more to be desired than a perineal one, which is often inadequate and inaccessible, or to have a very low anastomosis followed by multiple perineal sinus tracts. An abdominal colostomy properly made, with removal of the primary lesion, can be effectively controlled, and will cause a minimum of trouble. The conceptions of a colostomy are based upon inadequate information, sentiment, and mental abhorrence. Those who have colostomies properly performed for removable lesions and who have learned a procedure of caring for them have little or no trouble with them. The bowel in time seems to adapt itself to its new environment and functions with a minimum of inconvenience.

Those colostomies made as palliative procedures for unremovable lesions give the most distress, and are the source of the greatest amount of discontent and criticism. One never hears of the colostomies that function well. They are not discussed. One only hears of those that are uncontrollable, function poorly and cause great distress. It has been my observation that they are palliative colostomies, and much of the dissatisfaction and annoyance result primarily from the advancing, progressive unremoved lesion.

The problem is one which must be evaluated by the surgeon. Each case must be individualized, and the procedure most suitable for the occasion selected, keeping in mind his technical ability and the probable extent of the lesion. The ultimate aim is to cure the patient, and sentiment should not influence his mature judgment or make him unmindful of cancer extension. Let not extrinsic influences and personal appeal divert your surgical judgment.

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